PLANT BREEDING ABSTRACTS

Vol. XXIII, No. 1
(Abstracts Nos 1—799)

Compiled from World Literature
by the

COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS

1 January, 1953

Commonwealth Agricultural Bureaux,
Farnham Royal, England

TABLE OF CONTENTS

PAGE

Statistics* 1
Genetics* 1
Variations, Modifications, Mutations 16
Adaptation 17
Evolution 18
Cytology* 19
Diseases, Injuries, Bacteria, Fungi, Viruses* 29
Insecticides 39
Crop Plants 39
Cereals 53
Wheat 55
Buckwheat 65
Oats 66
Rye 68
Maize 69
Barley 76
Rice 82
Other Cereals 86
Forage Grasses 86
Leguminous Forage Plants 90
Roots and Tubers 94
Fibres 103
Sugar and Starch Plants 107
Stimulants 113
Minor Crop Plants 117
Fruits and Nuts 121
Forestry 134
Vegetables 138
Book Reviews 154
New Journals 168

Note.—Initialed reviews are written by the following:—

Mrs. A. Hagger	A. H.
Dr. J. P. Riches	J. P. R.
Dr. J. Wishart	J. W.

---

* General studies, see also individual crops.

C. A. B.
27 JAN 1953
FILE

Plant Breeding Abstracts

Vol. XXIII, No. 1

*STATISTICS

1 Federer, W. T. and Robson, D. S.
General theory of prime-power lattice designs. VI. Incomplete block design and analysis for p^5 varieties in blocks of p^2 plots.
Mem. Cornell Agric. Exp. Sta. 1952 : No. 309 : Pp. 37.

Methods of analysis are given for incomplete block designs involving p^5 varieties in blocks of p^2 ($p =$ a prime number), special attention being given to the case when $p = 2$. Balanced arrangements are presented for $p = 2$ and $p = 3$.

2 Ward, G. C. and Dick, I. D.
Non-additivity in randomized block designs and balanced incomplete block designs.
N.Z. J. Sci. Tech. 1952 : **33** : Sect. B. : 430–35.

"This paper gives an iterative solution of the equations arising from the minimization of the error sum of squares when the treatment effects are not independent of the block effects." [Authors' summary].

3 Keuls, M.
The use of the "studentized range" in connection with an analysis of variance.
Euphytica, Wageningen 1952 : **1** : 112–22.

It is shown that the use of the *t*-test in association with analysis of variance in field trials to ascertain which varieties differ significantly in yield is liable to error. The alternative proposed by the author is a "studentized" range test.

4 **Notes on a short course in methods of sampling and the establishment of experiments.**
Bull. Edinb. Coll. Agric. 1952 : No. 32 : Pp. 55.

Smith, A. M., Moon, F. E. and Simpson, K. The sampling of soils and agricultural crops. (pp. 5–15).

The errors associated with sampling soils and crops are discussed; with respect to the latter, special reference is made to variability in the composition of the crop, the size of the sample, and the relative advantages of a systematic or a random procedure.

Davey, V. M'M. Methods of sampling root crops. (pp. 15–21).

Methods of sampling to determine the total weight and composition are outlined, with reference to the efforts made to minimize the variability between roots and the unequal distribution of solids.

Holmes, J. C. The establishment of experiments. (pp. 35–49).

The layout of randomized blocks and Latin squares is described, with data on the modifications necessary for multiple factor experiments and split plot and confounded designs. The effects of site, size and shape of plot on the precision of experiments are also discussed.

Lawley, D. N. The principles and accuracy of sampling. (pp. 49–55).

Advantages of random sampling, including the avoidance of bias and the possibility of assessing the magnitude of sampling errors, are surveyed, with emphasis on the need for stratification, or some other form of restricting the randomness of an experiment, to reduce these errors.

*GENETICS

5 **Genes and mutations.**
Cold Spring Harbor Symposia on Quantitative Biology 1951 : **16** : Pp. 521.

Goldschmidt, R. B. Chromosomes and genes. (pp. 1–11).

Arguments are advanced against the classic concept of the particulate and distinct gene, mainly with reference to investigations on *Drosophila*. It is suggested that point mutations are only the effects of chromosomal rearrangements on a submicroscopic scale. In discussing position effects, it is concluded that not a single type of mutant action is known which does not occur also as a position effect. The problem of whether position effect is produced by the break itself or by the accompanying rearrangement is examined; the latter is

---

* General studies, see also individual crops.

regarded as the more probable cause. Speculations are presented on the possible manner in which chromosome segments with mutant action are integrated into the whole chromosome as parts of a major unit and on the role of intercalary heterochromatin.

McClintock, B. Chromosome organization and genic expression. (pp. 13–47).

The author presents a comprehensive account of her investigations on the mutability of certain loci, which is associated with the chromosome type of breakage–fusion–bridge cycle of mitosis in maize (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 837), and of her conclusions and speculations concerning the organization and functioning of the nucleus, chromosome and gene. The loci studied affect the anthocyanin pigmentation and other characters of the endosperm, and in some cases also the characters of the mature plant tissues. The presence in the short arm of chromosome 9 of four marked loci that affect endosperm characters has been of particular importance in analysing the events occurring at mutable loci.

The behaviour of two main classes of mutable loci is described: (1) those requiring a separate activator for the mutability to be expressed; and (2) those that are autonomous with respect to the factor controlling onset of mutability. The loci c^{m-1}, bz^{m-1} and bz^{m-2}, occurring in *Ds–Ac* material, exemplify the first type (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2294). These conditions of loci *C* and *Bz* are initiated by breakage events at *Ds* (Dissociation), which lead to the transposition of *Ds* at or close to the locus *C* or *Bz*. The initial change due to the altered position of *Ds* is an action at the locus *C* or *Bz* resulting in a phenotypic effect resembling that of the corresponding recessive allele; subsequent removal of *Ds* from its new position produces a return to the apparently full dominant expression of either locus. It is noted that a homozygous deficiency of the chromosome segment including *C* or *Bz* also results in the corresponding recessive phenotype. The *Ds* type of activity is dependent upon a dominant activator, *Ac*, whose state and dose control the location and time of occurrence of new positions of *Ds*. *Ac* exerts this control irrespective of its situation in the chromosome complement.

The following examples of autonomous loci are analysed: mutable *luteus* locus; a_2 at the locus A_2 for aleurone and plant colour, on chromosome 5; and a_1^{m-1} at A_1 for aleurone and plant colour, on chromosome 3. All three loci mutated to higher or lower levels of quantitative expression.

The origin and behaviour of two related mutable loci, c^{m-2} and wx^{m-1}, are discussed. The wx^{m-1} condition of locus *Wx* originated in a plant carrying c^{m-2} and *Wx*. Both c^{m-2} and wx^{m-1} exhibit a quantitative mutational behaviour. The series formed by c^{m-2} and wx^{m-1}, like the series of c^{m-1}, bz^{m-1} and bz^{m-2}, is *Ac*-controlled. In the former series mutations of intermediate alleles occur in the presence of *Ac*. Since stability is maintained when *Ac* is absent, it has been possible to isolate a stable series of quantitative alleles at *C* and also at *Wx*. As in the case of *C* and *Bz*, tissue with a homozygous deficiency for locus *Wx* has a phenotype similar to that of the recessive *wx*.

The types of mutability occurring at any one locus are compared, with reference to *Wx*, *C* and A_1. Both autonomous and activator-controlled mutable conditions of each locus occur.

All the *Ac*-controlled mutable loci undergo changes of state, characterized by alterations in the relative frequencies of the different recognizable types of mutation. The state and dose of *Ac* control the time and place of the occurrence of certain mutations during development; the alterations in *Ac*-controlled loci are therefore related to changes in the state of *Ac* rather than to changes in the state of the mutable loci. An autonomous mutable locus also undergoes changes of state, as discovered in the case of a_1^{m-1}. In this type of locus, however, control of the time and occurrence of mutations depends upon a component of the locus itself.

Mutable loci are discussed in relationship to the concept of the gene. The author's experiments have led her to the following primary hypothesis: instability arises from alterations that do not directly change the genes themselves but affect the functioning of the genic components at or near the locus of alteration.

Analysis of the behaviour and action of *Ac* in cell and plant generations has indicated that *Ac* itself is unstable, and that for any particular state or dose of *Ac*, the time of occurrence of changes of *Ac* is controlled by *Ac* itself. The effects of the time of alteration in states of *Ac* are discussed in relation to whether aberrant or clear-cut Mendelian ratios for *Ac* are obtained. The precisely timed somatic segregations of *Ac* and of the mutable loci under *Ac* control are interpreted as a process effecting differentiation. Variegation may represent merely an example of the usual process of differentiation at an abnormal time in development. The nucleus, it is further suggested, is organized into definite units of action, the potentials for types of genic action in any one kind of cell differing from the potentials in another kind of cell. This non-equivalence of the nuclear components is the outcome of events that occur during mitotic cycles. The differential mitotic segregations, it is suggested, are of several types. Some involve controlling components, such as *Ac*, and produce sister nuclei differing with respect to these components. Differential mitoses also produce alterations that render particular genes reactive and others inactive; inactivity is considered to occur because the genes are "covered" by other nongenic chromatin materials. In considering the chromosome elements responsible for initiating instability of loci, it is suggested that a locus becomes mutable as the consequence of the alteration of an element of the heterochromatin produced by the breakage–fusion–bridge cycle. Once such an "out-of-phase" condition occurs, others may subsequently arise because of the physical changes in the chromatin at the mutable locus, leading, at times, to transposition of this chromatin to new locations. Finally, the author expresses the view that the position-effect variegations in *Drosophila* and *Oenothera* are essentially similar to the variegations associated with mutable loci in maize.

Stadler, L. J. Spontaneous mutation in maize. (pp. 49–63).

The importance of analysing the mutational behaviour of specific loci is stressed, since the general assumption that induced point mutations occurring at miscellaneous loci in a population are in fact gene alterations is unwarranted. A survey is presented of work on the genic variability and spontaneous mutation of the loci *R* and *A*, which are concerned with the anthocyanin pigmentation of the seed and plant in maize. The *R* alleles extracted from established races exhibit extreme variability in phenotypic action, which is expressed in a wide range of differences in intensity of effect, and in marked divergences in the relative pigmentation of different tissues. The occurrence of numerous *R* alleles distinguished by slight differences in intensity of action suggests that undetectable subliminal mutation may be a major factor in the evolution of the *R* alleles. In the case of both *R* and *A*, the unit regarded as a single gene on the basis of experiments on transmission appears to consist of a complex of independently mutating elements. These elements may not be wholly analogous to unrelated genes; the independently mutating elements affecting seed colour and plant colour, designated (*S*) and (*P*), respectively, which occur in the allele *R*, are to some extent interdependent, since mutation of (*P*) affects the probability of subsequent mutation of (*S*) (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1873). The value of studies of mutation to unstable alleles and of mutational sequence in the elucidation of genic behaviour is illustrated by analysis of the mutation of r^{ch} and r^{r} to unstable alleles, and mutational sequences involving *aDt* material or r^{r}.

Horowitz, N. H. and Leupold, U. Some recent studies bearing on the one gene–one enzyme hypothesis. (pp. 65–74).

The following arguments are produced in favour of the hypothesis of one gene to one enzyme as a possible explanation of the behaviour of nutritional mutants of *Neurospora* and other microorganisms. At least 84% of the known nutritional mutants of *Neurospora* require single chemical substances. Provision of the essential factor usually results in a normal phenotype; failure of the production of the completely normal phenotype, such as the occurrence of partial sterility, can be ascribed to secondary effects unrelated to the mode of gene action. Biochemical analysis of the mutants has in many cases indicated that the effect of mutation is to block a single step in the synthesis of the growth factor; in a few cases it has been demonstrated that the mutants are deficient in the specific enzyme involved.

The question of whether the known biochemical mutants are in fact highly selected samples from which mutants depending upon multifunctional genes have been excluded as a result of the screening procedure is raised. This problem has been studied by means of temperature mutants of *Neurospora* and *Escherichia coli*, in which the mutant nutritional behaviour is fully expressed only in a particular temperature range, and which, in connexion with this particular problem, have the advantage that they can be recovered without regard to the nature of the induced biochemical deficiency or the composition of the complete medium used. The data from these experiments have led to the conclusion that the usual screening procedures are not likely to prevent to any considerable extent the recovery of mutants controlled by multifunctional genes; explanation of the fact that the genes detected by these methods appear to be preponderantly of the unifunctional type cannot therefore be sought in the procedures employed. In most cases, it is finally suggested, the metabolic function of the gene is to produce an enzyme which catalyses the formation of a product with low molecular weight; the mode of biosynthesis of large molecules, especially proteins, is probably not an enzymatic process in the usual sense, the protein molecule being built directly from the aminoacids or their simple derivatives by a single catalyst, rather than by accretion. Such a mechanism would explain the mutual independence of the pathways of synthesis of different enzymes.

Ephrussi, B. and Hottinguer, H. On an unstable cell state in yeast. (pp. 75–85).

Experiments on the descendants of isolated mother cells budded in the presence or absence of euflavine have provided evidence of a state of instability existing at the level of the individual cell. The unstable condition is characterized by a high rate of euflavine-induced mutation for colony size and form, lasting over numerous cell divisions, and is regarded as involving cytoplasmically controlled particles. Preliminary results suggest that the observed progressive mutant action of euflavine upon mother cells may consist of destruction of the particles or their mutation to an inactive form.

Spiegelman, S. The particulate transmission of enzyme-forming capacity in yeast. (pp. 87–98).

Experiments on long-term adaptation to galactose fermentation in *Saccharomyces Chevalieri* are reported. The possibility that this adaptation is based on mutation and selection has been ruled out by finding that the induced heritable modification leading to the positive phenotype capable of rapid production of enzyme does not occur in the absence of the adaptive substrate, and that reversion to the original slowly adapting, or negative, phenotype is a mass phenomenon. Contact with substrate induces in a small proportion of cells the heritable modification resulting in the positive phenotype; in the presence of substrate this modification is transmitted indefinitely from one cell generation to another; in the absence of substrate, reversion to the negative phenotype occurs after five to six generations. From an analysis of the quantitative relations between the proportion of positives as a function of generation it is concluded that particulate elements responsible for enzyme formation are being randomly distributed between mother and daughter cells. It has been calculated that the minimal number of particles required for the positive phenotype is in the neighbourhood of 1, and that the probability of any particle passing into the daughter cell is approximately 0·5. With such a mode of determination of enzyme formation, two cells of identical genotype can exhibit heritable differences in capacity to form enzyme. No definite suggestions can at present be made concerning the nature of the particles.

L'Héritier, P. The CO_2 sensitivity problem in Drosophila. *(pp. 99–112).*

Sensitivity to CO_2, so far discovered in only one stock, appears to be due to a cytoplasmic self-reproducing unit, termed the genoid, which shows some features characteristic of virus infection and others typical of plasmagene inheritance. Acquired sensitivity is inherited only through the female. Some of the males whose CO_2 sensitivity has been inherited from the female side transmit the character. Sensitivity inherited from the male behaves as if acquired through injection or implantation. A mutation of the normal genoid has been discovered; this mutation, designated ω, differs only from the normal α-genoid by its incapability of male transmission. Flies with heritable immunity from genoid α have also been discovered; the body, termed ρ, upon which this immunity depends, is transmitted indefinitely as a cytoplasmic constituent, but appears to have lost the invasive power of the normal genoid, and is compared with a provirus. The alternative hypotheses of an external origin of the genoid as a pathogenic virus from another organism, and its internal origin from a normal cytoplasmic component are discussed. According to the former hypothesis, the ρ variant represents an advanced stage of genoid evolution; and its behaviour leads the author to suggest that all or nearly all cases of cytoplasmic inheritance may be traced to symbionts of external origin. According to the latter hypothesis, the ρ variant is an intermediate step in the transformation of the normal cytoplasmic constituent to the α genoid.

Provasoli, L., Hutner, S. H. and Pintner, I. J. Destruction of chloroplasts by streptomycin. (pp. 113–20).

Exposure to streptomycin permanently bleaches chlorophyll in seed plants and some algal flagellates. Analysis of crosses between normal and bleached organisms is required to determine whether streptomycin damages the chloroplast directly, or by causing a genetic change. Difficulties which have so far prevented this analysis are described. Experiments by the authors and other investigators on various aspects of chloroplast destruction by streptomycin are surveyed. It is postulated that streptomycin acts at two different sites: one affecting the chloroplast, termed the bleaching site, and the other responsible for killing. It should be possible to select flagellates resistant to killing but with sensitive bleaching sites.

Michaelis, P. Interactions between genes and cytoplasm in Epilobium. (*pp. 121–29*).

The author surveys investigations carried out by himself and his collaborators on relationships between genic and cytoplasmic inheritance in *Epilobium* spp. The experiments lead to the main conclusion that nuclear genes and plasmic units react together to form a complicated genetic system. It is thought that similar nuclear-cytoplasmic interactions exist in other organisms but that these are difficult to detect except in specially favourable material such as *Epilobium.*

Stephens, S. G. "Homologous" genetic loci in Gossypium. (*pp. 131–41*).

The anthocyanin (*R*)–cluster (*Cl*) linkage group is known to be common to both the A and D groups of the diploid species of *Gossypium* and to the corresponding subgenomes of the amphidiploids. A discussion is given of the possible types of locus changes which could account for the behaviour of both the cluster (short branch) and anthocyanin series of alleles. In the cluster series the normal alleles from the diploid groups can mask mutant alleles in either the A or D genome of the amphidiploids *G. hirsutum* and *G. barbadense.* The normal alleles of the two amphidiploids are however more specific, masking only mutations at their respective loci. It is therefore postulated that the normal "diploid" allele is the structural equivalent of both of the "amphidiploid" normal alleles; the evolution of the *Cl* locus is thus thought to involve a rearrangement of existing functions. The hypothesis of a pseudoallelic system is suggested for the numerous *R* alleles occurring in Asiatic and American diploids and New World amphidiploids, but, without further extension, such a system cannot explain all the available experimental data, e.g. the behaviour of the mutants tinged ghost (cf. *Plant Breeding Abstracts*, Vol. XII, Abst. 686) and tinged (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 382). The loci in the amphidiploid subgenomes are appreciably less complex than the corresponding loci in the diploids, and probably represent secondary simplifications. The numerous patterns of anthocyanin pigmentation at the diploid level are perhaps the result of the transformation of a single but unspecialized unit into a complex system in which the individual subunits are more highly specialized, i.e. localized in effect. Duplication has probably played a part in this transformation. At present no definite speculations can however be made as to whether or not actually new potentialities have arisen in the course of this transformation.

Bonner, D. M. Gene–enzyme relationships in Neurospora. (*pp. 143–57*).

The general concept that the primary role of genes is determination of enzyme specificity and that a single gene controls the specificity of a single enzyme is critically examined. Investigations on *Neurospora* mutants requiring niacin or tryptophane have shown that most of these strains have incomplete genetic blocks, and thus exhibit the phenomenon termed leakage, i.e. they are not totally unable to form the compound they specifically require for growth. For seven out of nine loci studied, leakage occurred. According to the data, alternative pathways of synthesis were probably not involved. Induced biochemical blocks in *Neurospora* therefore appear to be relative rather than absolute, and although genes control biochemical reactions they do not determine simply presence or absence of enzyme. Experiments on lactoseless strains of *Neurospora* and *Escherichia coli* suggest that genic alterations do not necessarily result in change in enzyme specificity, but that time and rate of enzyme formation are influenced by genes as well as by substrate. From investigations on suppressor mutations in *Neurospora* it has been found that more than a single gene can affect the formation of an enzyme involved in the synthesis of an aminoacid. A discussion is given of the *Q* locus strains of *Neurospora.* These strains have similar biochemical blocks for niacin formation, and probably represent three closely linked units. These units appear genetically as three closely linked genes; biochemically however they appear as three component parts of a larger unit which is necessary for the performance of a single specific reaction characteristic of niacin formation. Thus the nature of control of a biochemical reaction appears to be very different when viewed from a genetic standpoint than when considered in biochemical terms. In view of these results it is argued that the unitary concept of gene action is not likely to advance understanding of the problems involved. Finally it is suggested that genic control of enzyme formation by determination of specificity on the one hand and by determination of rate and time of formation on the other are not mutually exclusive concepts.

Lewis, E. B. Pseudoallelism and gene evolution. (*pp.* 159–74).

A pseudoallelic series is regarded as a close succession of old and new genes, each of the latter having arisen by a two-step process consisting of (1) duplication and (2) mutation of one of the two genes produced by duplication to a new but closely related function. Evidence in support of this hypothesis is discussed with reference to examples of biochemical reactions conditioned by pseudoallelic genes, reported by other investigators for *Gossypium*, maize, *Aspergillus* and *Neurospora*, and to research, mainly by the author, on pseudoallelic series showing position effects in *Drosophila* and on the cytology of three of these pseudoallelic systems. The significance of the author's theory to the study of gene evolution is examined.

Schultz, J. and Redfield, H. Interchromosomal effects on crossing over in Drosophila. (*pp. 175–97*).

The authors survey the results of their experiments on the interrelations of nonhomologous chromosomes in crossing-over in *Drosophila*. In structural homozygotes with the normal sequence of genes, positive and negative correlations of crossing-over in given regions of nonhomologous chromosomes may occur. The positive correlations are possibly the result of response to environmental factors; the negative correlations on the other hand provide evidence of interference between nonhomologous chromosomes. The facilitation of crossing-over by heterologous inversions is analysed. Response to inversion shows regional differences, those regions with normally a low coefficient of crossing-over being particularly influenced. The effects of combined inversions upon interference, and differential responses of different regions to various inversions are also discussed. Heterochromatin has been found to play an important part in interchromosomal effects. The regional differences between crossing-over in the triploid and in the diploid follow the same pattern as those produced in the most extreme combinations of inversions; thus these differences may be regarded as part of the larger problem of chromosomal interrelations in crossing-over. In the author's view, the causes of the interrelations between nonhomologous chromosomes should be approached from the standpoint of the establishment of the polarized pattern of the meiotic nucleus antecedent to crossing-over, special emphasis being laid upon the disturbances in pairing which would lead to increased intertwining of the chromosomes involved. The relevance of a better understanding of the nature of crossing-over to the theory of the gene is briefly analysed.

Auerbach, C. Problems in chemical mutagenesis. (*pp. 199–213*).

Problems in chemical mutagenesis are analysed, mainly with reference to investigations on *Drosophila*. It is suggested that the various groups of compounds may act in different ways; a search for a common mode of chemical mutagenesis is possibly misguided. The effects of different chemical mutagens may differ between organisms and between cells of the same organism; it is emphasized that such differences should be given full consideration in comparative studies of mutagenesis. The similarities between the genetic and cytological effects of chemical mutagens and radiation are striking but for several reasons this parallelism should not be overrated. Well-established differences between the effects of radiation and of mustard compounds are described. In *Drosophila*, formalin action resembles that of mustard gas in the production of delayed mutations and in the relative scarcity of translocations.

Demerec, M. and Hanson, J. Mutagenic action of manganous chloride. (*pp. 215–28*).

Experiments were carried out on the B/r strain of *Escherichia coli*, the study of the induction of mutations from streptomycin dependence to nondependence being their chief object. The effectiveness of $MnCl_2$ as a mutagenic agent was greatly influenced by the previous treatment of the bacteria. Its effect was increased by prewashing in high concentrations of some chemicals, but reduced when washed in low concentrations of the same or other chemicals. Prewashing in yet other chemical solutions resulted in the suppression of mutation. The mutagenic action of $MnCl_2$ was also affected by the physiology of the bacteria, i.e. it differed according to whether treatment was applied in the growing or resting stage, and whether growth took place with or without aeration. The degree of mutagenicity was proportional to the concentration of $MnCl_2$, up to approximately 0·005%, after which further increase was ineffective. It was also proportional to duration of treatment, up to about 30 mins. Within the range of 1° to 37° C, mutagenic action was greatly increased by higher temperature during treatment. Tests with several other chemical mutagens indicated that their effectiveness was not influenced by prewashing. It is thought that the genetically active component of $MnCl_2$ is bound to specific sites within the cell. On the following grounds it is argued that $MnCl_2$ induces mutation in some indirect way rather than directly: its effect is not specific, being shown with other types of mutants besides those with a changed reaction to streptomycin; similar patterns of mutation are induced by $MnCl_2$, ultraviolet light and X rays; and the effects of treatment with both ultraviolet rays and $MnCl_2$ are not additive. It is suggested that $MnCl_2$ affects the metabolic activity of the cells so as to render the gene systems less stable than they are normally.

Roberts, R. B. and Aldous, E. Manganese metabolism of Escherichia coli *as related to its mutagenic action. (pp. 229–31).*
Preliminary experiments have led to the following tentative conclusions. Manganese is adsorbed on the proteins or nucleic acid of the cell into a loosely bound complex. The quantity adsorbed is determined chiefly by the concentration of manganese and other competing ions and by the number of available adsorption sites, but is not closely dependent upon temperature. The chemical change resulting in mutation is however dependent upon temperature, requiring a higher one than the process of adsorption. The nature of this second stage has not yet been elucidated. It could, for instance, be due to the action of a manganese-activated enzyme or a reaction between manganese and nucleic acid.

Levan, A. Chemically induced chromosome reactions in Allium Cepa *and* Vicia Faba. *(pp. 233–43).*
A review is given of recent research on the cytological effects of chemical compounds upon *A. Cepa* and *V. Faba*. The general problems arising in the study of the effects of chemicals upon animal and plant cells are discussed; the value of quantitative standardized tests on chromosomes in root tips is stressed. Cytological reactions are surveyed with respect to: (1) lethal and toxic reactions; (2) reversible physiological reactions, manifested as c-mitotic phenomena; and (3) structural changes in the chromosomes. The recent discovery by several investigators that substances act preferentially on certain chromosome regions is particularly important.

Jensen, K. A., Kirk, I., Kølmark, G. and Westergaard, M. Chemically induced mutations in Neurospora. *(pp. 245–61).*
The technique and validity of the *Neurospora* back-mutation test are considered. The test takes advantage of the fact that some biochemical mutants which do not normally grow on a minimal medium may revert, either spontaneously or as a result of treatment with a mutagenic agent, to the wild type of growth. The results from Mendelian crossing tests have given evidence that the reversions are in all probability due to back-mutation and not to nongenetic adaptation, though the possibility of the existence of a suppressor gene which is closely linked with the gene for adenine requirement cannot be excluded. A comparative survey is given of the mutagenic effects of radiation and chemicals, as shown by the *Neurospora* reversion test, experiments on *Drosophila*, *Allium* and *Vicia*, and by the penicillin test with bacteria. The possible modes of the mutagenic action of different types of compounds are discussed in specific chemical terms. The general hypothesis is put forward that those substances found to be mutagenic in back-mutation tests on *Neurospora*, possess this property because free radicals, formed by the decomposition of the somewhat unstable substances, react with molecules within or near the gene, sufficient energy being liberated for changing the gene from one allelic form to another. In the case of mustard gas compounds, the formation of free radicals has, so far as the authors are aware, not been proved; possibly the energy released by their reaction is of the same order of magnitude as that released by the reaction of free radicals, or free radicals may be formed in the course of the highly complicated reactions of these compounds. The significance of discrepancies between the positive and negative mutagenic effects observed in experiments with the above-mentioned organisms is examined. Mutagenic chemicals are grouped into three classes: (1) those giving positive results in any test and which probably induce both genic and chromosomal changes; (2) certain chemicals, e.g. phenol, urethane and ethylene imine, which give negative results in *Neurospora* reversion tests but positive ones with *Drosophila*, and which are highly toxic and possibly as a general rule induce only chromosomal aberrations; and (3) compounds which apparently only act upon bacteria. The hypothesis that mutagenicity is due to the reaction of free radicals is discussed in relation to the possibility that spontaneous mutation is similarly produced. It is envisaged that the metabolic system of the cell may in the future come to be regarded as a system of mutagens and antimutagens. Finally, it is suggested that unstable precursors formed as a result of

genetic blocks due to mutations may act as mutagens during their decomposition; some of these precursors may be so unstable that they can react only over a short distance, thus inducing mutation in loci only a short distance from the gene whose synthetic action is blocked; possibly the unstable loci reported by McClintock (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2294) may be associated with an unstable precursor mechanism.

Gustafsson, Å. Mutations, environment and evolution. (pp. 263–81).

Environmental, genetic and competitive factors upon which the viability of a given genotype depends are analysed, and it is concluded that viability is a highly complex phenomenon. In a survey of the behaviour of X-ray-induced mutants of barley, pea, white mustard, *Poa pratensis* and *Drosophila*, when studied in an environment optimal for the mother strain, it is shown that some mutants are equal or superior under standard conditions but that the number of such mutants is very low. In self-fertilizing diploid cereals they amount to approximately 1 or 2 per 1000 hereditary changes. Homozygous mutants, which are ordinarily inferior, may under adverse or extreme conditions have a wider selection value in comparison with the parent strains. Studies of heterozygous mutants of barley and other plants lead to the conclusion that effect of a factor upon viability greatly changes with the genotype, e.g. an induced lethal may have increased viability when heterozygous; that an alteration from recessiveness to dominance may readily occur according to the genotype; and that in natural populations crossing barriers are often established by means of specific mutations. Competitive ability is analysed. Examples of the so-called Montgomery effect, or a situation in which the competitive ability of a genotype does not coincide with its maximal productive capacity, are examined. Experiments have shown that the expression of a mutation, in terms of dominance or recessiveness, can be altered not only by genotypical changes but also by abiotic and biotic factors; furthermore negative or positive heterosis can be built up. In considering the problem of systemic mutation, the author argues that major mutants play a considerable part in evolution.

Giles, N. H. (Jun.). Studies on the mechanism of reversion in biochemical mutants of Neurospora crassa. *(pp. 283–313).*

Genetical analyses of methionine independent strains arising spontaneously or by ultraviolet irradiation of a methionineless mutant show that reversions are due to suppressor mutations (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1468); on the other hand, inositol-requiring mutants give rise to inositol independent strains, either spontaneously or after ultraviolet or X irradiation, mainly by reverse mutations (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2127 and Vol. XIX, Abst. 1646). The inositol independent strains resemble the original wild type, but the frequency with which they arise from the inositol-requiring mutants varies. Crosses between mutants having marked differences in reverse mutability indicate that these differences are inherited by the offspring; thus, although phenotypically indistinguishable, the inositol-requiring mutants are allelic forms. The use of marker genes closely linked with the inositolless locus has shown that conditions inherent at this locus are alone responsible for observed differences in reverse mutability. Recent evidence suggests that crossing-over occurs between certain inositol-requiring mutant alleles; further attempts are being made to determine the degree of complexity of this locus.

Hollaender, A., Baker, W. K. and Anderson, E. H. Effect of oxygen tension and certain chemicals on the X ray sensitivity of mutation production and survival. (pp. 315–26).

The influence of high and low oxygen tension on the lethal and mutagenic action of X rays has been demonstrated in a streptomycin dependent mutant and a purineless variant of *Escherichia coli* B. In the latter, oxygen increases with the same efficiency both the lethal effects of X rays and the induction of purine nondependence, suggesting that the production by X rays of an active molecular substance responsible for genetic and lethal effects depends on the presence of oxygen during irradiation. Although oxygen increases the lethal effects of X rays on the streptomycin dependent strain, it has little influence on the reversion to streptomycin nondependence; thus it appears that an oxygen-sensitive substance is responsible for lethal action but that mutation to streptomycin nondependence results either from the action of a molecular substance insensitive to oxygen or from the direct action of X rays.

Data are presented to show that many reducing agents, carboxylic acids, glycerine, alcohols and compounds containing SH groups reduce the X ray sensitivity of bacteria if present during irradiation. The protective effect appears to be due to reduction of oxygen concentration in the suspension; respiratory inhibitors reduce this protection so that mutagenic and lethal effects are again obvious.

Novick, A. and Szilard, L. Experiments on spontaneous and chemically induced mutations of bacteria growing in the chemostat. (*pp. 337–43*).

Further experiments using a strain of *Escherichia coli* which is sensitive to bacteriophage T 5 and which mutates spontaneously to phage resistance (cf. *Plant Breeding Abstracts,* Vol. XXI, Abst. 1630) have been carried out to determine whether the choice of a controlling growth factor alters the mutation rate. A high rate of spontaneous mutation occurred when tryptophane was the controlling growth factor; a fall to a third of this rate was recorded when lactate was used.

It has been suggested that when either phosphorus or nitrogen are controlling factors, the rate at which genes reproduce is slowed down to correspond with the decreased rate of protein synthesis; thus according to the error hypothesis, by which mutations arise due to an error in the process of gene reproduction, the mutation rate per hour would fall proportionately with increasing delay in gene generation. Data are, however, presented to show that, with either phosphorus or nitrogen as the controlling growth factors, the increase in mutation rate per hour is only slight when there is a three-fold increase in generation time. Theophylline-induced mutations also proved to be dependent on the choice of the controlling growth factor, suggesting some factors in common between spontaneous and induced mutations. With tryptophane as the controlling factor, other purine derivatives were found to be mutagenic; some connexion, explaining this action, is suspected between these mutagenic agents and the purine constituents of the nucleic acid.

Atwood, K. C., Schneider, L. K. and Ryan, F. J. Selective mechanisms in bacteria. (*pp. 345–55*).

The mechanism of periodic selection is further discussed (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2386), with special reference to reverse mutation in *Escherichia coli* from a histidineless (h^-) mutant to a histidine independent (h^+) strain. The continued potentiality for production of new types possessing a selective advantage may be due to (*a*) interaction between components of the population, setting up a circular mutation pattern, or (*b*) a successively better adaptation to the conditions of the medium. In the latter case, the time over which selection operates would be limited, but if occasional changes occur in the character of the environment the process is perpetuated. Differential tests of stocks from the same stage of parallel serial transfer experiments showed that the stocks were not selectively equivalent thus indicating that there is no predetermined sequence of mutational steps; at any one time there seem to be several ways in which a selective advantage may be conferred by mutation.

Witkin, E. M. Nuclear segregation and the delayed appearance of induced mutants in Escherichia coli. (*pp. 357–72*).

The substance of this paper has already been summarized in *Plant Breeding Abstracts*, Vol. XXII, Abst. 1649.

Bisset, K. A. The genetical implications of bacterial cytology. (*pp. 373–79*).

Cytological evidence is presented for the occurrence of multicellular and multinucleate elements in bacterial cultures, in addition to the more usual resting phases. These observations provide the basis for a tentative construction of diagrammatic life cycles, interpreted in cytogenetical terms, for four different types of bacteria; the relative predominance of phases, corresponding to the haploid and diploid alternations in higher organisms, varies considerably between the different types. It is however stressed that although analogies are suggested between certain bacterial phenomena and cytogenetic processes in other organisms, the significance of these resemblances remains inconclusive and may be merely fortuitous.

DeLamater, E. D. A new cytological basis for bacterial genetics. (*pp. 381–412*).

Research undertaken at the University of Pennsylvania, demonstrating the occurrence of mitosis in representatives of four major bacterial groups and giving evidence for the vegetative nature of sporulation, is outlined. Cytological observations of conjugation tubes, fusion between haploid cells and formation of large nuclei which appear to be diploid are reported for *Bacillus megatherium*; nuclear configurations suggesting phases of meiosis are reproduced, but exact chromosomal counts have been impossible so far.

Lederberg, J., Lederberg, E. M., Zinder, N. D. and Lively, E. R. Recombination analysis of bacterial heredity. (*pp. 413–43*).

A general review is given of developments in the application of recombination analyses to problems of genetic interest since preliminary experiments on genetic recombination were first reported (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 11). Reference is made to alternation between diploid and haploid phases; attempts to correlate cytological observations with genetic investigations; concepts of allelism; and evidence for cytoplasmic inheritance. Most of the research has been concerned with strains of *Escherichia coli*; the differences between the system of recombination in the latter and various interpretations of transformation occurring in *Pneumococcus* are emphasized, but it is pointed out that *Salmonella* shows some features common to both.

Ephrussi-Taylor, H. Genetic aspects of transformations of pneumococci. (*pp.* 445–56).

The different kinds of induced transformation recorded for *Pneumococcus* are reviewed, with evidence for the occurrence of at least six different transforming agents in the desoxyribonucleate of the penicillin-resistant smooth strain. During transformation it appears that the nucleic acid component of an autoreproducing element in the cell is replaced by nucleic acid of an extraneous origin but having a closely related structure and function. The nature of the transforming agents is discussed in an attempt to justify the supposition that they are independent genetic units. Details of the properties of transforming agents produced by strains with normal and mutant capsules suggest that a mutated capsular agent differs from the normal in having a localized structural alteration; the greater the extent of the alteration, the more pronounced are the phenotypic consequences. Allogenic transformations giving rise to normal capsular agents depend on the combination of parts of mutated agents and synthesis of a new agent; if a portion of the mutant agent is retained, the new agent is consequently slightly abnormal.

Although it is indicated that systematic analysis of the genetic elements of bacteria may be possible by means of transformation techniques, this cannot be achieved without use of recombination studies. Genetic recombination is apparently possible among the independent agents which determine various cell characters; these are analogues of the genes of higher organisms. Recombination may also occur within each of the agents, in which case it would be comparable with crossing-over within a gene. It is suggested that each agent may in fact correspond to a molecule.

Hotchkiss, R. D. Transfer of penicillin resistance in pneumococci by the desoxyribonucleate derived from resistant cultures. (*pp.* 457–61).

Extracts from a penicillin resistant strain of *Pneumococcus* were added to the medium in which a penicillin sensitive strain was cultured; subsequent exposure to penicillin revealed numerous penicillin resistant cells, suggesting that the genetic mechanism determining resistance in the donor strain had been transferred to the formerly sensitive strain. Transformation is apparently effected by the desoxyribonucleate fraction extracted from the donor strain, since desoxyribonuclease will inhibit the activity of the transforming agent. Data on the rate of appearance of transformants resistant to increasing concentrations of penicillin indicate that resistance may be acquired by stepwise mutations, thus resembling the development of resistance in *Staphylococcus* (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 1346).

Lysed cells of a smooth strain of *Pneumococcus* sensitive to penicillin will also liberate mutagenic factors inducing the formation of smooth bacteria, with resistance to penicillin, in a formerly rough strain resistant to penicillin. By lysate transformation streptomycin resistance has also been transferred to streptomycin sensitive pneumococci. A smooth culture of *Pneumococcus* resistant to streptomycin and sensitive to penicillin was lysed with penicillin and added to a rough culture showing resistance to penicillin; the survivors included rough and smooth cells resistant to penicillin and rough cells with resistance to both penicillin and streptomycin, thus showing that smoothness and streptomycin resistance can be transferred independently.

There is a possibility that conditions suitable for lysate transformation occur in nature, when, under adverse conditions, survivors acquire some of the heritable properties of a vulnerable population.

Luria, S. E. The frequency distribution of spontaneous bacteriophage mutants as evidence for the exponential rate of phage reproduction. (*pp.* 463–70).

The frequency of readily detectable spontaneous *r* and *w* mutants of phage T 2L produced during lysis of *Escherichia coli* B, subjected to single infection, proved constant in successive replications. This indicates that mutants are distributed clonally, and contrasts with the almost random distribution of recombinant phage from mixed infection (cf. *Plant Breeding*

Abstracts, Vol. XIX, Abst. 1667). Clonal distribution of mutants means that the initial genotype of the infective virus does not possess the monopoly of replication; its derivatives are in turn sources of new replications, and the elementary process of replication is a reduplication.

Since the recombinants produced after mixed infection neither reduplicate themselves nor give rise to clones it is assumed that they arise late in the process of phage maturation. Thus it appears probable that reduplication of the phage genotype takes place mainly by elements which are not yet in the form of mature phage particles.

Hershey, A. D. and Chase, M. Genetic recombination and heterozygosis in bacteriophage. (pp. 471–79).

Information obtained from analyses of mutational patterns and recombination tests (cf. *Plant Breeding Abstracts*, Vol. XVIII, Absts. 1458 and 2109) indicating that inheritance in bacteriophage T2H follows much the same plan as in other organisms is reviewed. Data are presented on segregation of progenies of heterozygotes bearing differentially linked pairs of *h* and *r* marker genes. Usually the heterozygotes segregate into types resembling one parent and one recombinant of the original cross respectively, showing that segregation precedes multiplication; alternatively segregation may produce both parent types accompanied by their recombinants (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1667). When the marker genes are very closely linked the doubly heterozygous offspring may constitute 59% of the total. Since the frequency of doubly heterozygous offspring is not specific for individuals, being the same for five different *r* markers and one *h* marker, it is unlikely that the formation of such heterozygotes depends on structural characters of particular mutants. It is assumed that the formation of heterozygotes is related to the formation of recombinants; doubly heterozygous individuals may be formed preferentially from zygotes in which recombination has occurred and thus each daughter phage receives one parental and one recombinant set of genes. Such assumptions infer that the phage particle is diploid.

Mirsky, A. E. Some enzymes of isolated nuclei. (pp. 481–82).

Variability in the type of enzyme contained in nuclei of different mammalian and avian tissues is described; enzymes vary both with tissue differentiation and in the course of tissue functions. It appears probable that many enzymes within nuclei affect nuclear activity by influencing the environment in which the chromosomes lie. Some of these components may in fact be gene products.

Sonneborn, T. M. Some current problems of genetics in the light of investigations on Chlamydomonas *and* Paramecium. *(pp. 483–503).*

It is claimed that the past decade is characterized by the prominence of studies concerned with the genetics of microorganisms and by the use of microorganisms for investigating biochemical genetics. The ways in which microorganisms are specially suitable for genetical research are pointed out, with particular reference to the part played by Moewus and his coworkers, from 1927 onwards, in directing attention to the genetics of *Chlamydomonas* and using strains of the *Ch. eugametos* group for the first extensive systematic investigation of biochemical genetics in any microorganism. A review of current problems involving microorganisms includes sections on crossing-over, pseudoalleles, primer reactions, mutagenesis, interrelations of nucleus and cytoplasm and gene variability and its implications. The mutability of diverse alleles of the genes *F* and *M* of *Chlamydomonas* is discussed in an appendix.

Flory, L. E. The television microscope. (pp. 505–09).

The use of television at Princeton University, NJ, to create an image of material under the microscope which can thus be seen simultaneously and without delay by more than one person is described. Many hitherto unforeseen possibilities are discussed; with this equipment the effects of ultraviolet radiation on living material can be studied by direct observation.

6 **Portugaliae Acta Biologica Série A 1949–1951 : Vol. R. B. Goldschmidt :** Pp. 882.

This volume has been compiled in celebration of the seventieth birthday (1948) of R. B. Goldschmidt, whose achievements are outlined in an introduction by A. Quintanilha.

Babcock, E. B. The development of fundamental concepts in the science of genetics. (pp. 1–46).

This contribution has been already summarized in *Plant Breeding Abstracts*, Vol. XXII, Abst. 6.

Stebbins, G. L. (Jun.) and Walters, M. S. The evolutionary significance of two synthetic allopolyploid species of Bromus. (*pp. 106–36*).

A full report is given of a study of the allopolyploids *B. maritimus–B. Trinii* and *B. carinatus–B. Trinii* and their evolutionary significance (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1011).

Clausen, R. E. The primary cytogenetic classes of Nicotiana. (*pp. 137–46*).

A cytological classification of *Nicotiana* is proposed. The primary cytogenetical groups are characterized by the following: uniformity in chromosome number and morphology; free crossability within subsections; production of intrasubsectional hybrids with a high degree of meiotic pairing and some fertility; consistent behaviour of members of a subsection as regards crossability with members of other subsections and pairing in the hybrids; low degree of pairing and considerable or complete sterility in hybrids between different subsections, whether or not the parent species belong to the same section; and consistency in geographical distribution. Free interchange of genes is probably limited to species which are members of the same subsection, and to diploid–amphidiploid hybrids when the diploid is one of the parental species or a member of the same subsection. In the latter hybrids, genes may be transferred from the diploid to the genomic counterpart in the amphidiploid; the reverse transfer rarely takes place, if at all.

Caspari, E. On the action of genes in development. (*pp. 147–60*).

The problem of the mode of action of genes in development is discussed, mainly with reference to *Drosophila*, *Ephestia* and *Paramecium*, but also with some consideration of work on the genetics of maize, *Epilobium* and *Neurospora*.

Moewus, F. Zur biochemischen Genetik des Rutins. (*The biochemical genetics of rutin*). (*pp. 161–99*).

A Portuguese race of *Chlamydomonas eugametos* was found to excrete a substance that inhibited conjugation in gametes of the normal strain. A mutant with the same properties but in intensified degree was used for the isolation of the active principle, which proved to be rutin. The mutant gave rise to a second mutant, in which rutin was replaced by quercitin, which does not inhibit conjugation; another mutant produces isorhamnetin.

The nonconjugating race, styled f. *agametos*, can be induced to conjugate by darkening, by ciscrocetindimethylester and by boric acid. Alternation between temperature extremes, such as 4° and 65° or 75° C induced a number of conjugating mutants from f. *agametos*, some lacking rutin, others rutinose, others rhamnose. These were crossed with f. *agametos* and with one another; the results are reported and show that the three mutant types are conditioned by three genes *ru*°, *runo*° and *rha*°; the first and last-named are linked, and situated in the 4th linkage group, *runo*° being in the 7th. Experiments with different genotypes showed that rutin is synthesized in three steps as follows: l-rhamnose + d-glucose → rutinose + quercetin → rutin, the three processes being controlled by genes *rha*$^{+}$, *runo*$^{+}$ and *ru*$^{+}$ respectively. Another nonconjugating mutant was found in which quercetin was absent; it gave 1 : 1 segregation with the normal and was conditioned by *qu*°, in linkage group 9. By crossing this with the other mutants, a strain with the genotype *rha°ru°runo°qu°* has been obtained.

Viveiros, A. Karyological studies on the Aloinae VI. Polyploidy, asynchronous chromonemata multiplication and general karyotype. (*pp. 200–30*).

The caryotypes of *Poellnitzia rubriflora* and *Chamaealoe africana* are described, and the phylogenetical origin of different types of olistherochromatic distribution in the Aloineae is discussed. The occurrence of polyploidy in sect. *Tesselatae* of *Haworthia* is surveyed; the polyploid series of *H. tesselata* comprises the greatest number of strains and greatest range in chromosome number in the genus. The importance of polyploidy and hybridization in the speciation of the Aloineae is stressed. Frequent cases of mixoploidy observed in sect. *Tesselatae* and *P. rubriflora* are discussed with reference to their possible origin through endopolyploidy, asynchronous multiplication of the chromonemata, and functional chromatic agglutination. A useful table is given summarizing data obtained by the author and other investigators on chromosome numbers in *Haworthia* species and strains.

Löve, Á. and Löve, D. The geobotanical significance of polyploidy. I. Polyploidy and latitude. (*pp. 273–352*).

The occurrence of polyploids in 15 European and arctic countries is surveyed. The frequency of polyploids has been found to increase with increase in latitude, as postulated by Hagerup (cf. *Plant Breeding Abstracts*, Vol. II, Abst. 381). This general observation applies not only to the angiosperms as a whole, but also within the dicotyledons, monocotyledons, families, orders, and comparable plant communities.

Possible causes of the presumed better adaptability of polyploids are comprehensively discussed. In the section on morphological characters, polyploids are considered in relation to vegetative dispersal, perennial habit and life form. The data compiled by the authors do not support Gustafsson's hypothesis (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 722 and Vol. XX, Abst. 114) that the distribution of polyploids is explicable on the basis of alterations in the biological spectrum. Nor has any reliable correlation been detected between the occurrence of polyploidy and apomixis or other types of vegetative reproduction.

The frequency of polyploids is analysed in relation to growth rate, photoperiodism, self-compatibility, hardiness, excess of water in the soil and drought conditions. In general, polyploids are considered to be better adapted physiologically than diploids in the case of most of the factors considered, although some of their properties might be of negative adaptive value under arctic conditions.

Finally, the selective adaptability of the different classes of polyploids is discussed on the basis of the theoretical genetical analysis published by G. Melchers.

Heitz, E. Weitere Beobachtungen an den Geschlechtsmutanten, insbesondere den Intersexen von Pellia Neesiana. (*Further observations on sex mutants, particularly the intersexes of* P. Neesiana). (*pp. 353–66*).

By irradiation of the thallus with 2000 r., three different mutants were obtained in which antheridia were produced on female thalli. One of the mutants bore only antheridia and displayed a translocation between the X chromosome and one of the autosomes. The other two were intersexes.

A fourth mutant was more vigorous in growth at low temperatures than the original and produced archegonia two months earlier.

Dalcq, A. L'apport de l'embryologie causale au problème de l'évolution. (*The contribution of causal embryology to the problem of evolution*). (*pp. 367–400*).

The subject is discussed from the point of view of animal evolution.

Serra, J. A. A cytophysiological theory of the gene, gene mutation and position effect. (*pp. 401–562*).

The author expounds much more fully his theories, mainly with reference to *Drosophila* (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2311). In discussing theories on the gene, he stresses the contradictions that have arisen because of the general lack of correspondence between the concepts of the physiological gene and its cytological equivalent. Position effects are classified into two types, mimic and pure. Mimic position effects are explained by assuming an inactivation of + alleles located near the breaks, the effects of known gene mutations being simulated. The rearrangements causing pure position effects, on the other hand, bring about a sequence of genetic material capable of forming new genes.

Gene activity, it is further postulated, is generally exerted through the production of a relatively simple but strongly specific compound, the haptogene, which serves as a basis for the synthesis of apoferments by the nucleus–cytoplasm system. Gene reduplication and gene activity are relatively independent. The functioning of the gene takes place according to definite steps, the activity of each gene having a certain number of quanta levels, Q, usually of the order of 3–10.

The evolutionary aspects of the gene and chromonema are discussed in relation to the control of mutation and to heterochromatization. Mutations of the polygenic type are regarded as being of foremost importance in evolution. Such quantitative mutations are probably due to chromosomal rearrangements and to gene mutations in approximately equal proportions. Mutability is controlled by buffering action of the polygenic type. The role of heterochromatization in maintaining the stability of the genotype, by mass or individual inactivation of sudden gene increases, is analysed.

Gene mutation and chromonema breakage are regarded as essentially similar processes. Because of the relatively small amount of energy required to break the chromonema, it is postulated that the chromonema is composed of minimum blocks or nemameres, and that the gene consists of several nemameres, equal in number to the maximum quantum number Q. Each nemamere is joined to the others by relatively weak links. These links are however strongly reinforced in stages other than pachytene crossing-over by interactions with the nucleoplasm and matrix. The unity of the gene in crossing-over results from the differential deposition of the matrix nucleoproteins, in turn due to the haptogene specificity of each gene. Nemameres may be reactivated or inactivated according to whether events leading to mutation or mimic position effects occur near or within the gene. Activation or reactivation of each nemamere is regarded as an all-or-none process. Since gene mutation ordinarily involves only reactivation or inactivation, only quantitative differences result. Mutation, it is postulated, is brought about by a break of a contact between two nemameres of a gene; the break may cause the folding (inactivation) or unfolding (activation) of the region of the polypeptide chains involved in haptogene formation. The links or the contacts themselves remain with about the same mean strength after mutation as before; it is also argued that the stability of the gene chains is little affected. The problem of directed mutation is briefly discussed on the basis of this hypothesis.

Mainx, F. Die Bedeutung der Chromosomen-Aberrationen in natürlichen Populationen. (The significance of chromosome aberrations in natural populations). (pp. 563–92).

The methods of preservation and elimination of chromosome aberrations in mixed populations are discussed, with some general remarks on their frequency in natural populations of different groups of animals and plants, and the role they have played in evolution.

Barigozzi, C. A general survey on heterochromatin. (pp. 593–620).

Investigations on the cytology and genetical effects of heterochromatin in plants and animals are reviewed.

Rezende-Pinto, M. C. de and Lemos-Pereira, A. de. A case of post-meiotic chromatic reduction. (pp. 652–62).

Large and small spore mother cells were observed in a strain of *Dryopteris*; the former had about twice the number of bivalents at diakinesis as the latter. The large mother cells underwent a third division, usually giving rise to eight spores; this division was probably reductional.

Stadler, L. J. Spontaneous mutation at the R *locus in maize. IV. An* R*-linked modifier of* R *mutation rate. (pp. 785–97).*

A dominant modifier of the rate of mutation of the gene R^r for seed colour has been identified in an R^g R^r plants. When heterozygous, the modifier reduces the rate of mutation of R^r to r^r to about one-ninth of the rate in sib plants lacking it. The locus of the modifier is probably situated between *R* and *G*.

Kaufmann, B. P. An evaluation of the applicability in cytochemical studies of methods involving enzymatic hydrolysis of cellular materials. (pp. 813–30).

An account is given of the technique of enzymatic hydrolysis and its application in the analysis of chromosome structure during the various stages of mitosis.

Müntzing, A. The meiotic pairing of isochromosomes in rye. (pp. 831–60).

In plants with two isochromosomes, the degree of pairing between these two chromosomes was lower than that between the corresponding standard fragments; this decrease was caused by the frequent occurrence of pairing between the two homologous arms of the same isofragment. In plants with three or four isofragments, some isotrivalents were produced, but because of the lower average frequency of chiasma formation most of the isofragments occurred as univalents or isobivalents. In plants possessing various numbers of standard fragments of the rye Östgöta Gråråg [Östgöta Grey rye] and the corresponding isofragments, pairing between the two types was random. The origin of the large isofragment from the standard is thus finally proved (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 2375). In plants containing standard fragments of Vasa II and large isofragments of Östgöta Gråråg, pairing between the two types was not random, the frequency of heterobivalents being lower than expected. This result supports previous evidence that the standard fragments of the two varieties are not entirely homologous; their standards must however have originated from the same type of chromosome. The importance of studies of accessory chromosomes in rye and other plants in elucidating the role of heterochromatin is stressed.

7 Riley, H. P.
"Gene" and "genetics."
Amer. Nat. 1952 : **86** : 249–50.

The history of the terms gene and genetics is given. It is emphasized that "genetics" was not derived from "gene," but preceded it, being proposed by Bateson in 1906. Johannsen first suggested use of the term "gen" in 1909.

8 Raper, J. R.
Chemical regulation of sexual processes in the thallophytes.
Bot. Rev. 1952 : **18** : 447–545.

A general survey is given of control of copulatory mechanisms by (*a*) chemical agents of extra-specific origin, designated ectohormoids, and (*b*) sex hormones of intraspecific origin, in both homothallic and heterothallic species. Reference is made to the compatibility between mating types of *Neurospora*. The influence of genetic constitution on the cis/trans ratio of crocetin-dimethyl esters, which determine gametic functions in *Chlamydomonas*, is very briefly discussed (cf. Abst. 5).

9 WILCZYNSKI, J.
L'hérédité mendélienne peut-elle être exprimée par une ou plusieurs formules binomiales? (**Can Mendelian heredity be expressed in one or several binomial formulae**?)
CR Acad. Sci. Paris 1951 : **232** : 562–64.

It is shown that Mendelian heredity, exclusive of crossing-over, can be reduced to a single binomial expression.

10 SÁNCHEZ-MONGE, E.
Herencia cuantitativa. Resolución poligénica de dos aspectos de la misma. (**Quantitative inheritance. Polygenic resolution of two aspects of it**).
Genet. Iber. 1951 : **3** : 177–82.

Mathematical calculations are presented showing that the mean value of a quantitative character in the selfed progeny of an individual varies between the intensity of the parent and half this value, according to whether there is absence of dominance or complete dominance. The calculations assume the existence of polygenic inheritance and that the effects are equivalent and additive.

11 MAINLAND, G. B.
Epistatic ratios involving two phenotypes.
Heredity 1952 : **6** : 259–61.

Simple methods for determining F_2 and test cross epistatic ratios involving two phenotypes are described. These methods may be used conveniently for a variety of combinations in breeding programmes and for χ^2 tests.

12 CARTER, T. C. and ROBERTSON, A.
A mathematical treatment of genetical recombination using a four-strand model.
Proc. Roy. Soc. 1952 : **139** : Ser. B : 410–26.

A mathematical analysis is made of the relation between recombination fraction and map distance, assuming that two types of interference may intervene, namely: (1) chiasma position interference, the mutual effects of chiasmata as distributed along the length of the bivalent; and (2) chiasma type interference, the effect due to the number of chromatid strands shared by adjacent chiasmata.

When chiasma pairs involve two strands only, the limiting recombination fraction is 25%. With an increasing number of four-strand chiasma pairs, the limiting value rises to 50% and performs damped oscillations around this value for increasing map distances. When all chiasma pairs involve four strands, the maximum recombination fraction is 53·34% and this value may be exceeded if chiasma position interference is also operative.

There is also a possibility that linkages of less than 50% may be found between loci, each of which show a linkage exceeding 50% with an intermediate locus.

13 L'HÉRITIER, P. and PLUS, N.
Inactivation par les rayons X du virus responsable de la sensibilité au CO_2 chez la Drosophile. (**Inactivation by X rays of the virus responsible for the sensitivity of *Drosophila* to CO_2**).
CR Acad. Sci. Paris 1950 : **231** : 192–94.

The straight line obtained by plotting the logarithm of percentage survival of the genoid responsible for sensitivity to CO_2 in *Drosophila* against X ray dose indicates a particle size of *ca.* 42 mμ for the genoid.

14 MARQUARDT, H.
Die Natur der Erbträger im Zytoplasma. (**The nature of the hereditary elements in the cytoplasm**).
Ber. dtsch. bot. Ges. 1952 : **65** : 198–217.

A detailed review is presented of the present position reached in research on the nature and function of the hereditary elements in the plasmon and of genes.

15 BAUCH, R.
Genetische Studien an Artbastarden von Brandpilzen. (**Genetic studies on interspecific hybrids of smut fungi**).
Ber. dtsch. bot. Ges. 1951 : **64** : General-versammlungs-Heft 36–37.

The surviving nucleus in the mixoplasm, formed in the probasidium from an interspecific cross between *Ustilago* species, was used as experimental material for determining any possible modifying effects of the cytoplasm upon the nucleus. No such effects were found.

VARIATIONS, MODIFICATIONS, MUTATIONS

16 Zwaan, A. R.
De betekenis van de variabiliteit voor de veredeling **(The importance of variability in breeding).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 23 January 1952, Wageningen : 456–61 (Mimeographed)

After 45 years of experience in breeding, the author has come to the conclusion that minute variations in a particular direction can be increased by rigorous and constant selection to a point at which much greater unexpected variations may arise suddenly and may form the starting point for new strains. Examples of this process were drawn from the history of the breeding of radishes, rye and spinach in Holland.

17 Marchand, H.
Sur une loi d'union sélective dépendant de l'écart entre la valeur d'un caractère et une valeur optimum **(On a law of selective union depending on the deviation between the value of a character and an optimum value).**
CR Acad. Sci. Paris 1950 : **231** : 1029–31.

An analysis is given of the evolution of a population with respect to the frequency of the values taken by a quantitative character H, assuming that mating is random. Hardy's law is then derived, and the ultimate frequencies of the possible values of H are next calculated, supposing that the population is evolving under selective pressure and that the values of H are determined monomerically.

18 Marchand, H.
Valeurs asymptotiques des probabilités d'association des gènes dans une population soumise à une loi d'union sélective. **(Asymptotic values of the probabilities of gene associations in a population subjected to a law of selective union).**
CR Acad. Sci. Paris 1951 : **233** : 1259–61.

Further to his earlier paper on the frequency distribution of the values of a character in a population evolving under selective pressure (cf. Abst. 17), the author calculates the probabilities of specific gene associations in later generations. Expressions are derived for Fisher's f coefficients, and it is pointed out that though these have the same form as those established by Malécot in the case of homozygotes (cf. *Plant Breeding Abstracts*, Vol. XXI, p. 449), the forms for the heterozygotes are quite different.

19 Marchand, H.
Corrélations relatives au caractère primaire dans une population en équilibre soumise à une loi d'union sélective. **(Correlations relative to a primary character in a population in equilibrium subjected to a law of selective union).**
CR Acad. Sci. Paris 1951 : **233** : 1346–48.

Parent-offspring and sib correlations are worked out for the population model studied by the author in his earlier papers (cf. Abst. 18). The contribution H of a factor pair is analysed into a genetic component $\mathbf{H}$, the sum of two second order random variables corresponding to each gene, and a residue d denoting the effect of dominance.

20 Pimentel Gomes, F.
Sôbre algumas equações de diferenças relacionadas com a genética de populações. **(Some difference equations in connexion with population genetics).**
Ann. Esc. Agric. Queiroz 1950 : **7** : 1–11.

The ways in which linear difference equations describing the distribution of AA, Aa and aa individuals in a self-fertilizing population can be solved are worked out using the method of generating functions.

21 Wright, S.
The theoretical variance within and among subdivisions of a population that is in a steady state.
Genetics 1952 : **37** : 312–21.

"The variance of a character, dependent on a completely recessive gene, in a population with partially isolated strains in which the tendency toward fixation due to inbreeding is balanced at a certain level of inbreeding by occasional cross breeding, is analysed into the variance of strain means and the variance within strains. The formulae are in terms of gene frequency, inbreeding coefficient and gene effect.
The results are compared with those obtained by Robertson (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2390) in the case of subdivision into completely isolated strains that are tending toward fixation." [Author's summary].

22 PETIT, C.
Le rôle de l'isolement sexuel dans l'évolution des populations de *Drosophila melanogaster*. **(The role of sexual isolation in the evolution of populations of *D. melanogaster*).**
CR Acad. Sci. Paris 1951 : **232** : 2482–84.

It has been shown with reference to individuals carrying the *Bar* gene of *D. melanogaster* that the coefficient of sexual selection as between *Bar* and normal individuals varies during the course of evolution of a population with the frequency of the two male types.

23 WINTREBERT, P.
Le double mouvement progressif et rétrograde de l'évolution. **(The two-way movement, progressive and retrograde, of evolution).**
CR Acad. Sci. Paris 1950 : **231** : 808–12.

Continuing his discussion on the mechanism of evolution (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2418) the author distinguishes between progressive evolution resulting from spontaneous adaptive response to the environment, and retrograde evolution resulting from artificially induced mutations, which however are regarded as too violent to contribute towards evolutionary advance.

24 WINTREBERT, P.
La loi de récapitulation génétique et la recherche du passé, dans l'ontogenèse, par la voie des mutations provoquées. **(The law of genetic recapitulation and the study of the past, in ontogenesis, through induced mutations).**
CR Acad. Sci. Paris 1951 : **232** :1885–88.

Homeotic mutations are thought to be due, not to the appearance of new genes, but to a reversion to an ancestral condition that had later been masked by subsequent evolutionary changes.

25 WINTREBERT, P.
Le milieu actuel, facteur d'arrêt et de déviation des mutations, dans leur transmission héréditaire. **(The environment as a factor inhibiting or modifying the hereditary transmission of mutations).**
CR Acad. Sci. Paris 1950 : **230** : 1441–44.

In this consideration of the relation between mutations and the environment, the theory is brought forward that potentially hereditary variation may occur which remains undetected due to the inhibitory effect of environmental factors. The gradual disappearance of dauer-modifications is attributed to the more gradual inhibitory action of the environment.

26 VON BRANDT, H. and HÖHNE, G.
Über die mutagene Wirksamkeit einiger kanzerogener, zytostatischer und antibiotischer Agenzien. **(The mutagenic effect of some carcinogenic, cytostatic and antibiotic agents).**
Naturwissenschaften 1952 : **39** : 283–84.

Ethylurethane and tri-(2-chlorethyl)-amine-hydrochloride were the only ones of the compounds tested that had a mutagenic effect on injection into *Drosophila melanogaster*.

27 DE SONNAVILLE, P.
Chimaerenvorming bij het grote fruit. **(Chimera formation in the larger fruits).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 20 February 1952, Wageningen : 436–42. (Mimeographed).

The speaker reviewed old and recent examples of chimeras, with special mention of the practical advances made by American workers in this field. In one experiment of his own, by treating 500 apple seeds of Cox's Orange, Jonathan and Boskoop with colchicine, he obtained 20 tetraploids of Cox's Orange and 7 of Jonathan, and nearly half of them were chimeras with some diploid tissue.

Though C. A. Jörgensen's chimera, formed from a combination of potato and tomato tissue, was not resistant to *Phytophthora*, the tomato chimera formed from *Solanum Gaertnerianum* with a skin comprising several layers of black nightshade tissue seems to be only slightly susceptible to *Septoria Lycopersici*, in contrast to *S. Koelreuterianum* with one layer of black nightshade tissue.

The method of obtaining chimeras by binding the two halves of buds of two different varieties together was devised by J. Löschnig 35 years ago and is said to have been successfully used by A. Wszolek to obtain 211 chimeras from about 2000 grafts of apples. The speaker, however, had no success with this method.

ADAPTATION

28 DYHRENFURTH, K. and RÜBENSAM, E.
Die Mitschurin-Lyssenko-forschung in Mecklenburg. **(Mičurin-Lysenko research in Mecklenburg).**
Mitt. dtsch. LandwGes. 1950 : **3** : 292–93.

Reference is made to the foundation in Mecklenburg of a society for the study of Mičurinite biology applied to agriculture in all its branches.

29 LIMA-DE-FARIA, A.
Le "schisme" soviétique en biologie. (**The Soviet schism in biology**).
Bol. Ass. Filosofia Nat. 1951 : **2** : Pp. 34.

Reference is made to the published reports of the 1948 session of the Lenin Academy of Agricultural Sciences (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2000), deprecating the political nature of the argumentation and the absence of scientific reasoning, and commenting particularly on Lysenko's declaration that his report had been approved before the meeting. Examples are given of competition within species in both plants and animals, and attention is drawn to the insufficiency of the experimental evidence for the conclusions of the Lysenko school concerning such phenomena as graft hybrids; and to the confusion of ideas in their discussions of species, and equally in the pronouncements of Huxley on the inheritance of acquired characters and of most neo-Mendelians on the nature of inheritance in general, and on the physical localization of genes in particular. It is shown that now that the units of inheritance of the geneticists are being discussed in molecular terms, the difference between Mičurinist and Mendelian interpretations is often one of mere words.

30 PAREDES C., A.
La ciencia y la lucha doctrinaria contemporánea, frente al problema de la herencia biológica. (**Science and the contemporary controversy concerning the problem of biological inheritance**).
Bol. Inst. Cienc. Natur., Quito 1952 : **1** : 176–90.

Views on the nature of life and of the universe are traced from the period of the Ionic philosophers, with an analysis of the differences between the inductive and the intuitive schools; the elements of the chromosome theory of inheritance are expounded, and attention is drawn to a number of exceptions which strain the theory inconveniently. The Soviet theory of inheritance is then outlined, with particular reference to graft hybrids, vernalization and the new hybrids obtained by Lysenko from its application. The author conceives the gene not as a granular body but a localized condition of a physical or chemical order, not confined to the chromosomes. The Lysenko theory is considered obscure and excessively generalized, and its author, in addition to being a brilliant investigator, to be an impassioned politician; his critics in the West, on the other hand, are described as uncompromising, blind and lacking in objectivity.

31 GLUŠČENKO, I. E.
(**A reply to my opponents**).
Priroda (Nature) 1952 : No. 5 : 67–72. [Russian].

In reply to Levan and Müntzing (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2302), Mičurinite charges against Morganist genetics, inbreeding and the use of polyploidy are reiterated. It is claimed that facts established by formal geneticists are accepted by Mičurinites, but not their Morganist interpretation. Mičurinites acknowledge the existence of chromosomes but reject the chromosomes as special organs of inheritance. Extracts from Swedish journals are cited in support of the present writer's thesis that the barley, rye and clover strains obtained at Svalöf by X irradiation and colchicine treatment, have no practical value and that inbreeding has given disappointing results with rye.

EVOLUTION

32 (**The success of the new theory of the origin of cells. An interview with the active member of the Academy of Medical Sciences of the USSR, O. B. Lepešinskaja**).
Priroda (Nature) 1952 : No. 1 : 85–87. [Russian].

Lepešinskaja's experiments (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1509) have been repeated successfully by Herčik and other scientists in Czechoslovakia. Investigations into the origin of the plant cell by Gluščenko at the Institute of Genetics of the Academy of Sciences of the USSR are referred to.

33 OPARIN, A. I., LYSENKO, T. D., NUŽDIN, N. I. and DMITRIEV, V. S.
(**The 70th anniversary of the death of Charles Darwin**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1952 : No. 3 : 3–66. [Russian].

A meeting of the Section of Biological Sciences and the Institute of Genetics of the USSR Academy of Sciences in April 1952 commemorated the seventieth anniversary of the death of Darwin. It was opened by Oparin and addresses were delivered by Lysenko, Nuždin, Dmitriev and Studitskiĭ. The latter discussed the development of Darwinian ideas in medicine by I. P. Pavlov.

Lysenko, T. D. (pp. 4–5).

Mičurinite science purges Darwinism of its idealist content and develops the materialist principles of Darwin and Lamarck. Darwin's main errors were the acceptance of Malthusian ideas and his disregard of qualitative changes in evolving organisms.

Nuždin, N. I. Darwin and Mičurinite biology. (pp. 6–29).

The various aspects of Darwin's theories relating to variability, hybridization, vigour and inheritance are discussed from the Mičurinite view point. Darwin is criticized for overestimating the role of selection in evolution and underestimating the effects of environment upon organic life, and for the mechanist elements of his theory of pangenesis.

Dmitriev, V. S. The development of Darwin's theory of the origin of species in the research of Academician T. D. Lysenko. (pp. 30–49).

It is claimed that Darwinism has been promoted by Soviet materialism. In this connexion the Mičurinite hypotheses on the origin and evolution of organic life, including the conversion of one species into another, are expounded.

34 'Espinasse, P. G.
Selection of the genetic basis for an acquired character.
Nature, Lond. 1952 : **170** : p. 71.

The writer comments upon C. H. Waddington's note describing experiments on selection for and against a crossveinless phenocopy produced in *Drosophila* in response to temperature shock (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1595). He regards Waddington's suggestions concerning natural selection as a corrective against too abstract an approach in evolutionary genetics, and a salutary reminder that selection acts upon organisms possessing qualities, and not upon genes.

35 Grandjean, F.
Les deux sortes de temps du biologiste. **(The two categories of biological time).**
CR Acad. Sci. Paris 1951 : **233** : 336–39.

Continuing his discussion on phylogenetic and ontogenetic time (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2421) the author shows how the distinction between these two categories of time resolves the contradictions encountered in descriptions of developmental sequences which occur in reverse order to the corresponding phylogenetic sequence.

36 Lanham, U. N.
Oparin's hypothesis and the evolution of nucleoproteins.
Amer. Nat. 1952 : **86** : 213–18.

The possible major chemical and biochemical phases in the origin and early evolution of life are discussed in accordance with Oparin's theory of the origin of life from coacervate droplets or systems of colloidal particles.

37 Forrest, A.
The origin of life. Endeavour prize essay.
Advanc. Sci., Lond. 1952 : **9** : No. **33** : 45–50.

Among numerous aspects considered is the hypothesis that protogenes were the first living substances, giving rise, by mutation, to the complex self-reproducing genes around which living matter became organized. The possible sequence of mutation of genes controlling enzyme reactions which contribute to biochemical synthesis is discussed, with reference to the evolution of genotypes capable of controlling chain reactions.

*CYTOLOGY

38 Ramanujam, S.
Cytology in India with special reference to crop plants.
Sci. & Cult. 1952 : **17** : No. **8** : Suppl. : p. 4.

The application of cytogenetical observations to studies on the origin and evolution of various crops, the behaviour of interspecific hybrids and induction of mutations is outlined, with some indication of consequent improvements in crop breeding.

39 Brachet, J.
Quelques effets des inhibiteurs des phosphorylations oxydatives sur des fragments nucléés et énucléés d'organismes unicellulaires. **(Some effects of inhibitors of oxidative phosphorylations upon nucleate and enucleate fragments of unicellular organisms).**
Experientia 1952 : **8** : 347–49.

Working with *Amoeba proteus* and *Acetabularia mediterranea*, the author found that, in regenerating nucleated halves of the latter organism, dinitrophenol and usnic acid induce profound morphological and chemical changes in the nucleus. From this it is concluded that the maintenance of nuclear structure and composition depends on energy production in the cytoplasm.

---

* General studies, see also individual crops.

40 Delay, C.
Recherches sur la structure des noyaux quiescents chez les phanérogames. (**Researches on the structure of the resting nuclei in the phanerogams**).
Rev. Cytol. Cytophysiol. Vég. 1946–47 : **9** : 169–222.

Detailed descriptions are given of representative eureticulate, reticulate, semireticulate and areticulate nuclei, further subdivided according to the presence or absence of chromocentres (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1605). Although various differences have been noted between nuclear construction in different tissues, these are believed not to modify the general classification referred to above.

41 Pasteels, J. and Lison, L.
Teneur des noyaux au repos en acide désoxyribonucléique dans différents tissus chez le rat. (**The desoxyribose nucleic acid content of the resting nuclei of different tissues in the rat**).
CR Acad. Sci. Paris 1950 : **230** : 780–82.

In an attempt to confirm the claim of Boivin, Vendrely and Vendrely (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2430) that the content of desoxyribose nucleic acid per nucleus was constant throughout the somatic tissues of higher animals and twice the gametic value, the authors analysed the nuclei of various tissues of the rat by a histophotometric method. The theoretical diploid value was observed in some tissues but considerable deviations from it in others.

42 Pasteels, J. and Lison, L.
Étude quantitative de l'acide desoxyribonucléique au cours de la formation du pollen chez *Tradescantia virginiana*. (**Quantitative study of desoxyribose nucleic acid during the formation of the pollen in *T. virginiana***).
CR Acad. Sci. Paris 1951 : **233** : 196–97.

Significant differences were noted between the absolute content of desoxyribose nucleic acid in the nuclei of the pollen mother cells, in the generative nuclei and in the tapetal cells.

43 Vendrely, R. and Vendrely, C.
Sur la teneur absolue en acide désoxyribonucléique du noyau cellulaire chez quelques espèces d'oiseaux et de poissons. (**On the absolute content of desoxyribose nucleic acid in the cell nucleus of some species of birds and fishes**).
CR Acad. Sci. Paris 1950 : **230** : 788–90.

Continuing their researches on the absolute content of desoxyribose nucleic acid per nucleus (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2430), figures are given for birds and fishes. The value for all the birds studied was roughly the same, but in the fishes, in addition to a basal value, species were observed with two or three times this value. It is suggested therefore that the major systematic groups have each a characteristic desoxyribose nucleic acid content per nucleus corresponding to a basic quantity of genic material.

44 Vendrely, C., Leuchtenberger, C. and Vendrely, R.
Sur la constance de la teneur du noyau cellulaire en acide désoxyribonucléique. (**On the constancy of the desoxyribose nucleic acid content of the cell nucleus**).
CR Acad. Sci. Paris 1951 : **232** : 2362–64.

Further evidence is provided on the constancy of the absolute content of desoxyribose nucleic acid per nucleus in the diploid tissues of animals (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2430).

45 Butler, J. A. V.
The nucleic acid of the chromosomes.
Endeavour 1952 : **11** : 154–58.

In a discussion on the possible molecular configuration of desoxyribonucleic acid brief mention is made of the transforming capacity of the polymerized form, with respect to *Pneumococcus* type II; this capacity indicates that a fraction of desoxyribonucleic acid can bring about an inherited change, thus "acting as a gene."

46 Alexander, P. and Fox, M.
Differences in reaction of macromolecules with X-rays and a nitrogen mustard.
Nature, Lond. 1952 : **169** : 572–74.

The effects of the nitrogen mustard $CH_3N(CH_2CH_2Cl)_2$ and of X rays on the viscosity of sodium polymethylacrylate solution were studied. The nitrogen mustard apparently reduces the viscosity of the polymethylacrylate by causing alterations in molecular shape, while X irradiation appears to achieve a comparable effect by molecular degradation via free radicals. It is suggested that the mode of action of these two agents on nucleic acid may be similar.

47 WEISS, J.
Possible biological significance of the action of ionizing radiations on nucleic acids.
Nature, Lond. 1952 : **169** : 460–61.

Experiments *in vitro* on X irradiation of nucleic acid in aqueous systems suggest that the biological effects of X irradiation may follow an attack by the radicals, produced by the primary action of the radiation, on the base or sugar components of the nucleic acid, leading to partial hydrolysis and a loss in the hydrogen bonding believed to be responsible for the high viscosity of desoxyribose nucleic acid solutions.

48 SOSA-BOURDOUIL, C.
Sur l'activité nucléasique des étamines d'*Helloborus foetidus* L. (**On the nuclease activity of the stamens of *H. foetidus* L.**).
CR Acad. Sci. Paris 1950 : **230** : 1098–99.

The maximum nuclease activity in *H. foetidus* is in the stamens. The ribonuclease activity is much greater than that of desoxyribonuclease, but the activity of the latter increases markedly as the anthers mature.

49 HOCQUETTE, M. and PRUDHOMME, V.
Le noyau quiescent dans l'axe hypocotylé de *Phaseolus vulgaris* L. (**The resting nucleus in the axis of the hypocotyl in *Ph. vulgaris* L.**).
CR Acad. Sci. Paris 1952 : **234** : 1303–05.

The resting nuclei referred to frequently exhibit the presence of considerable supplementary reserves of chromatin, the quantity varying according to the tissue. The extra chromatin is often deposited in supernumerary nucleoli.

50 TANDLER, C. J.
Nueva técnica para la localización histoquímica de lipoides argentófilos en el nucléolo. (**A new technique for the histochemical localization of argentophilic lipoids in the nucleolus**).
Phyton, Buenos Aires 1952 : **2** : 1–10.

The technique is as follows: (1) fix in formol or formol-digitonin; (2) wash in distilled water; (3) section; (4) treat sections with ammoniacal $AgNO_3$ in the dark and out of contact with air; (5) wash in ammonia, then in distilled water, then in acetic acid; (6) take up through distilled water and alcohol and mount in Euparal. The lipoids concerned stain black.

51 ALBUQUERQUE, R. M. and SERRA, J. A.
Nucleolar composition and the nucleolar zones of the chromosomes.
Portug. Acta Biol. 1951 : **3** : 187–93.

Cytological techniques used to demonstrate the presence of phospholipids in the nucleolus from telophase until late prophase are outlined. In *Vicia Faba* and *Allium Cepa* positive phospholipid reactions have been observed in the nucleolar zones of chromosomes from early metaphase until telophase. The ability of nucleolar zones to synthesize and accumulate lipids is discussed.

52 MEYER, J.
Gigantisme nucléolaire et cécidogenèse. (**Nucleolar gigantism and the development of galls**).
CR Acad. Sci. Paris 1950 : **231** : 1333–35.

Nucleolar enlargement is reported in a series of insect galls and possible reasons for it are discussed.

53 SHARMA, A. K. and BHATTACHARJEE, D.
Permanent mounts of chromosomes after 8-oxyquinoline and squashing.
Stain Tech. 1952 : **27** : 201–03.

Good permanent smear preparations with fully clarified chromosome structure can be obtained if root tip material is fixed in 0·002 M 8-oxyquinoline at 10–14° C for 3 hours, rinsed in water, and then soaked in *N* HCl at 55° C for 25 minutes, before squashing and staining.

54 HEILWEIL, I. J., HEILWEIL, H. G. and VAN WINKLE, Q.
Electron microscopy of chromosomes in smears.
Science 1952 : **116** : 12–14.

The technique of transferring smears to electron microscope screens by embedding them in collodion films gives satisfactory results with smears treated chemically by a wide range of methods. Electron microscope investigations of smear preparations of giant salivary glands of *Drosophila* and of meiotic chromosomes of microsporocytes of *Rhoeo discolor* are reported. Late second telophase chromosomes of *R. discolor* fixed only in acetic acid or treated by the Bretschneider procedure were composed of tubules, about 0·1 μ in diameter, twisted about each other, often in pairs; within the tubules dark segments approximately 100 x 50 mμ in cross-sectional area were distributed. Cases of apparently spiral structure may be due to the arrangement of the dark segments of the twisted tubules.

55 Berger, C. A., Witkus, E. R. and Joseph, T. C.
Tapetal cell and meiotic divisions in *Antirrhinum majus* L. and *Linaria vulgaris* Hill.
Caryologia 1952 : **4** : 110–14.

In *A. majus* and *L. vulgaris* the tapetal cells may undergo repeated endomitotic divisions, followed by a polyploid mitotic division. In *L. vulgaris* a third meiotic division was occasionally observed, but it was so irregular that the production of eight pollen grains from a single mother cell seldom occurred. In this species it was also noted that in some cases meiosis was reduced to one division, which resulted in diploid dyads and was followed by cytocinesis.

56 Devaux, H.
La théorie électrique de la mitose. (**The electrical theory of mitosis**).
CR Soc. Biol., Paris 1943 : **137** : 237–38.

Groupings comparable to those shown by metaphase chromosomes on the equatorial plate have been obtained with mustard or rice grains floating on mercury and charged electrostatically by a suitable inductor placed over them.

57 Wada, B.
(**Studies on the mechanism of cell division in living cells**).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 51–60. [Japanese].

A review is given of the studies of the author and other cytologists on mitosis in living cells.

58 Kodani, M.
(**The effect of nucleates on cell division**).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : p. 22. [Japanese].

An English version of this paper has been abstracted in *Plant Breeding Abstracts*, Vol. XIX, Abst. 1593.

59 Friedmann, E., Marrian, D. H. and Simon-Reuss, I.
Analysis of antimitotic action of certain quinones.
Brit. J. Pharmacol. 1948 : **3** : 263–70.

Friedmann, E. and Bailey, N. T. J.
Action of 1 : 4-naphthohydroquinone-diphosphate and its 2-methyl derivative on irradiated and non-irradiated rats with Jensen sarcoma.
Biochim. Biophys. Acta 1950 : **6** : 274–82.

In experiments with cultures of chick fibroblasts *in vitro*, treatment with maleic acid resulted in strong inhibition of mitosis. Citraconic, fumaric and mesaconic acids had no inhibitory effect. In the hydroquinone series, 1 : 4-naphthohydroquinone diphosphate was found to be 1000 times more antimitotic than 2-methyl-1 : 4-napthohydroquinone diphosphate. Complete inactivity was shown by 1 : 4-naphthohydroquinone monohydrogen succinate. In experiments *in vivo*, neither 1 : 4-naphthohydroquinone-diphosphate nor its 2-methyl derivative had a significant effect on the growth of nonirradiated sarcoma in rats, a small nonsignificant decrease in average size of tumour being obtained; both substances inhibited the action of X rays, the number of larger tumours being increased.

60 Bünning, E.
Über den Tagesrhythmus der Mitosehäufigkeit in Pflanzen. (**On the diurnal rhythm of mitotic frequency in plants**).
Z. Bot. 1952 : **40** : 193–99.

Chlorophyll-containing tissues such as aerial shoots or the aerial roots of some orchids show a diurnal maximum in mitotic frequency, which occurs at approximately the same time in long and short-day plants, but is shifted by changing the incidence of the light and dark phases. The mitotic frequency of subterranean roots and albino shoots did not manifest any clear reaction to illumination. These observations are believed to tell against a purely endogenous rhythm in mitotic frequency.

61 Corti, R.
Embriologia ed embriogenesi in "*Cytisus canariensis*" Steud. ("*Genista canariensis*" L.) con particolare riguardo ad una massa citoplasmatica a distribuzione preferenziale durante la megasporogenesi. [**The embryology and embryogenesis of *C. canariensis* Steud. (*G. canariensis* L.) with special reference to the role of a cytoplasmic mass in preferential distribution during megasporogenesis**].
Nuovo G. Bot. Ital. 1950 : **57** : 170–85.

A granular mass has been observed at the chalazal end of the megaspore mother cell. It is suggested that this structure may be responsible for the induction of meiosis and the further development of the chalazal megaspore.

62 BRIEGER, F. G. and KERR, W. E.
Sôbre o comportamento mitótico e meiótico de cromossomas policêntricos ou com ponto de inserção difuso. **(Mitotic and meiotic behaviour of polycentric chromosomes or chromosomes with a diffused attachment centre).**
Ann. Esc. Agric. Queiroz 1949 : **6** : 179–92.

In *Luzula* and *Tityus* the four parallel chromatids are visible in the attachment region as early as prometaphase.

63 EICHHORN, A.
A propos du synizesis. **(On synizesis).**
CR Acad. Sci. Paris 1950 : **230** : 1200–01.

Evidence is provided for the occurrence of chromosome aggregation or synizesis at the beginning of meiotic prophase in *Linaria* spp.

64 VAZART, J.
Constance et nature du synizesis chez trois espèces possédant des noyaux réticulés à calotte. **(The constancy and nature of synizesis in three species with reticulate pileolate nuclei).**
CR Acad. Sci. Paris 1950 : **230** : 24–26.

Synizesis is reported at the beginning of meiotic prophase in *Hordeum vulgare*, *Capsicum annuum* and *Solanum ovigerum* (cf. Abst. 63).

65 COOPER, D. C.
The transfer of desoxyribose nucleic acid from the tapetum to the microsporocytes at the onset of meiosis.
Amer. Nat. 1952 : **86** : 219–29.

The formation of globules having chromatin-like staining properties situated at the surface of the tapetal cells, and movement of these globules into the locule and ultimately into the nuclei of microsporocytes have been observed in *Lilium regale* and *L. Henryi* and 15 other species of angiosperms. The presence of such bodies between the spore mother cells and in close association with their peripherally situated nuclei was noted in an additional six species. Chromatin-like globules also passed from the nucellar cells of the ovule to the megasporocyte at the onset of megasporogenesis in *L. regale* and *L. Martagon*.

66 SPARROW, A. H. and RUBIN, B. A.
Effects of radiation on biological systems.
US Atomic Energy Comm. Docum. BNL–97 : 1951 : Pp. 53. [Mimeographed).

A survey is given of information and theories on the biological effects of radiation in plants and animals. The following aspects are discussed: types of radiation; radiation dosage units; transfer mechanisms of radiation energy; specific ionization; target theory; relation between chemical and biological effects of radiation; effect of radiation on microorganisms; cytological and genetic effects; carcinogenesis; physiological, embryological and developmental effects; and factors determining radiation sensitivity.

67 MIKAELSEN, K.
The protective effect of glutathione against radiation-induced chromosome aberrations.
Science 1952 : **116** : 172–74.

Cuttings of *Tradescantia paludosa* were subjected to continuous γ irradiation for 48 hours in the presence or absence of glutathione; the total radiation dose was 50 r. Reunions resulting in bridge formations at anaphase in the root tip cells were infrequent. They occurred with a frequency of only 3·03% in the absence of glutathione, and with frequencies of 1·03 and 1·74%, respectively, for the two strongest concentrations of glutathione, 3×10^{-4} and $1{\cdot}5 \times 10^{-3}$ M. The frequency of fragments also decreased when irradiation took place in the presence of glutathione at a concentration of 1×10^{-4} M or higher. With a concentration of $1{\cdot}5 \times 10^{-3}$ M, the frequency of fragments was 8·13%; chronic irradiation in the presence of glutathione induced 17·40% fragments. Two explanations of the effect of the chemical are suggested; either it protects the chromosomes from breakage or has a stimulating effect on restitution. The first possibility is regarded as the more likely.

68 MARQUARDT, H.
Über die spontanen Aberrationen in der Anaphase der Meiosis von *Paeonia tenuifolia*. **(Spontaneous aberrations in the meiotic anaphase of *P. tenuifolia*).**
Chromosoma, Berlin 1952 : **5** : No. 1 : 81–112.

In order to study the effect of chemical mutagens more accurately, an examination of the meiotic behaviour of untreated plants was undertaken. Various irregularities were observed in 15·9% of the cells and are described. They are confined to individual chromosomes and no disturbance of the spindle or the mechanism of division was detected, from which it is concluded that at some stage during cell division the chromosomes pass through a state of high lability which lends itself to structural alterations, particularly at certain less stable points in the molecular chains of the chromosome. In many cases the irregularity does not go so far as a direct breakage but is seen in the form of a chromatic segment. Their frequency is increased by low temperature.

69 LAMARDELLE, P.
Les relations entre le nucléole et les chromosomes au cours du ralentissement de la prophase provoqué expérimentalement par quelques agents chimiques. **(The relations between the nucleolus and the chromosomes when prophase is retarded experimentally by means of various chemical agents).**
CR Acad. Sci. Paris 1950 : **231** : 1540–42.

Under the influence of $HgCl_2$ and, to a lesser extent, benzene, points of adherence between chromosomes and the nucleolus become manifest in the preprophase stage.

70 DEYSSON, G. and ROLLEN, A.
Anomalies mitotiques provoquées par la diéthylmalonylurée (véronal) chez l'*Allium Cepa* L. [**Mitotic aberrations induced by diethylmalonylurea (veronal) in *A. Cepa* L.**].
CR Acad. Sci. Paris 1951 : **232** : 548–49.

The above substance has a slight c-mitotic action and retards the formation of a cell wall between the dividing nuclei; some chromosome fragmentation was also noted.

71 LAMARDELLE, P.
Influence de l'anoxie sur la caryocinèse dans la cellule végétale. **(The influence of lack of oxygen on caryocinesis in the plant cell).**
CR Acad. Sci. Paris 1951 : **233** : 1055–57.

When meristems of *Triticum vulgare* were deprived of O_2, the following anomalies resulted: tropocineses, reduction in the frequency of normal cell divisions, chromatid contraction, stathmocineses, and an accumulation of preprophase stages.

72 DEYSSON, G. and ROLLEN, A.
Action mitostatique de la diéthylmalonylurée (véronal) chez l'*Allium Cepa* L. [**Mitostatic action of diethylmalonylurea (veronal) on *A. Cepa* L.**].
CR Acad. Sci. Paris 1951 : **232** : 873–75.

When *A. Cepa* roots are treated with concentrations of the above substance below 0·5%, there is an initial inhibition of mitosis, followed by a temporary resumption of cell division, after which a second and ultimately lethal cessation of mitosis occurs.

73 D'AMATO, F.
Costituzione chimica e attività mutagena nei derivati dell'acridina. **(Chemical constitution and mutagenic activity of acridine derivatives).**
Nuovo G. Bot. Ital. 1949 : **56** : 655–56.

The following acridine derivatives have induced chromosome aberrations in *Allium Cepa*: acridine itself; 9-amino-acridine; 3-6 diamino-acridine; trypaflavine, acridine orange; and Phosphine. Other derivatives proved ineffective (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2044).

74 DEYSSON, G. and ROLLEN, A.
Sur l'action antimitotique de l'hydrazide maléique. **(On the antimitotic action of maleic hydrazide).**
CR Acad Sci. Paris **1951** : **233** : 820–21.

In experiments with *Allium Cepa*, maleic hydrazide was found to act primarily as an inhibitor of mitosis, and rather later as an inhibitor of cell elongation.

75 MASCRÉ, M. and DEYSSON, G.
Action antimitotique du para-amino-salicylate de sodium (PASNa) sur les méristèmes radiculaires d'*Allium Cepa* L. [**Antimitotic action of sodium para-aminosalicylate (PASNa) on the root meristems of *A. Cepa* L.**].
CR Acad. Sci. Paris 1950 : **230** : 1970–72.

When the above substance is applied to *A. Cepa* below the lethal concentration but above the mitodepressive level, stathmocinesis and extreme contraction of the chromosomes occur.

76 ROLLEN, A.
Action de la brucine sur la division cellulaire chez l'*Allium Cepa* L. **(The action of brucine on cell division in *A. Cepa* L.).**
Bull. Soc. Bot. Fr. 1952 : **99** : 175–78.

Experiments demonstrated a marked toxic action of brucine, which tended to inhibit mitosis in root tip cells of *A. Cepa*. The accompanying nuclear anomalies, i.e. pycnosis, deformations and stickiness, led to the death of the cell. A reversion to the normal state could, however, be obtained if the toxic treatment was stopped at an early enough stage.

77 KECK, K. and HOFFMANN-OSTENHOF, O.
Chromosome fragmentation in *Allium Cepa* induced by seed extracts of *Phaseolus vulgaris*.
Caryologia 1952 : **4** : 289–94.

Root tips of *A. Cepa* were treated with aqueous extracts of seeds of *Ph. vulgaris* which had been stored for one year or five to six years. After 8 hours' treatment with undiluted and diluted extracts from the one-year-old seed, inhibition of mitosis was observed; after a 60-hour period of recovery in tap water full mitotic activity was resumed, and chromosome aberrations, consisting mainly of fragments, were visible. Similar but more intense results were obtained with extracts from the older seeds. Chromosome and chromatid fragments occurred in approximately equal proportions. The bearing of the results upon the problem of the production of chromosome abnormalities in aged seeds is discussed.

78 King, E. D., Schneiderman, H. A. and Sax, K.
The effects of carbon monoxide and oxygen on the frequency of X-ray induced chromosome aberrations in *Tradescantia*.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 34–43.

A determination was made of the frequencies of dicentrics and centric rings induced in *Tradescantia* microspores which were exposed to X rays in various mixtures of air, nitrogen, oxygen and carbon monoxide. When applied simultaneously with X radiation, CO caused a marked increase in frequency of aberrations. This increase depended on the time of exposure to CO prior to irradiation; the longer the exposure time the greater the increase in frequency of aberrations, the maximum being reached after one hour. The increase in CO-induced aberrations was almost completely prevented when O_2 was simultaneously present in high concentration. Compression with O_2 caused a slight but significant increase in the frequency of dicentrics and rings. The following hypothesis is suggested in explanation of the effects of O_2 and CO upon radiation-induced aberrations. The CO affects a heavy-metal-containing enzyme in the microspores, probably cytochrome oxidase. When cytochrome oxidase is inhibited by CO, the flavoproteins act in a greater measure than usual as terminal oxidases, producing large amounts of H_2O_2, which render the chromosomes sensitive to irradiation. Oxygen, on the other hand, affects the flavoproteins; low oxygen tensions decrease their activity as terminal oxidases, thus reducing H_2O_2 production; high tensions have a reverse effect. When applied simultaneously with CO, oxygen presumably reverses the CO-inhibition of cytochrome oxidase. This hypothesis is not regarded as precluding the possibility of alternative actions of oxygen during irradiation.

79 Malheiros-Gardé, N. and Gardé, A.
Agmatoploidia no género "Luzula" DC. (**Agmatoploidy in the genus *Luzula* DC.**).
Genet. Iber. 1951 : **3** : 155–76.

Evolution resulting from increase of chromosome number by fragmentation, termed agmatoploidy by the authors, seems to have occurred in several members of the *Juncaceae*, *Cyperaceae* and related families and also in other groups. The possession of diffuse centromeres frequently leads to fragmentation in this way. Chromosome numbers observed in several species of *Luzula* suggest that the process may have occurred gradually, or that fragmentation may later have been followed by fusion of some of the elements. Studies of certain species suspected of agmatoploidy showed that *L. campestris* ($2n = 12$) had only 2 nucleoli and 2 SAT chromosomes; the same was true in *L. maxima* ($2n = 12$) and *L. Forsteri* ($2n = 24$). On the other hand *L. frigida* ($2n = 36$) had 6 SAT chromosomes and *L. multiflora* ($2n = 48$) had 8.

80 Salord, J.
Modificaciones estructurales patológicas en los cromosomas, producidas por temperaturas bajas. (**Pathological structural modifications in the chromosomes, produced by low temperatures**).
Bull. Soc. Portug. Sci. Nat. 1948 : **16** : 194–97.

One *Trillium* variety, after exposure to a temperature of − 9° C, showed intense chromosome agglutination and fragmentation. In another variety, agglutination only was observed in dividing cells, while peculiar nuclear excrescences developed in the resting cells.

81 Resende, F. and Manarte, M.
Physiological changes as the cause of mutations.
Portug. Acta Biol. 1951 : **3** : 219–33.

Details are given of mitotic and meiotic configurations in root tip cells of *Allium Cepa* and *Aloe mitriformis* var. *Commelinii* showing agglutination of chromatin between sister chromatids and between homologous and heterologous chromatids; agglutination occasionally occurs spontaneously, but is more frequent after treatment with 0·01% trypaflavin. Chromosome movements taking place while agglutination persists give rise to distensions. Chromatid fractures commonly result from agglutination and have been attributed to distension directly dependent on polar tension, but observations indicate that some fractures take place with very little distension, while relatively large distensions do not necessarily give rise to fractures; some configurations show fracture in only one of a pair of chromatids lying side by side. It is therefore suggested that calymmatic rarefaction, with subsequent chemical instability and despiralization produced by distension are more probable causes of fragmentation.

Chiasma formation and crossing over are considered to be localized and specific instances of similar chromatin agglutination.

82 Deysson, M.
Fragmentation d'un des chromosomes de l'*Allium Cepa* L. sous l'influence de l'uracile. (**Fragmentation of one of the chromosomes of *A. Cepa* L. under the influence of uracil**).
CR Acad. Sci. Paris 1952 : **234** : 650–52.

The formation of a single chromosome fragment regularly follows prolonged treatment of the roots of *A. Cepa* with uracil. The fragment usually divides at anaphase and forms two micronuclei.

83 Schwanitz, F.
Untersuchungen an polyploiden Pflanzen. XIII. Zellgrösse und Blütenfüllung. Untersuchungen an polyploiden Formen von *Bryophyllum daigremontianum* Hamet et Perrier sowie an gefüllten und ungefüllten Formen verschiedener Gartenpflanzen. (**Investigations on polyploid plants. XIII. Cell size and doubling in the flower. Investigations on polyploid forms of *B. daigremontianum* Hamet et Perrier and on double and single forms of various garden plants**).
Züchter 1952 : **22** : 244–54.

A tendency for the number of petals to increase as the degree of polyploidy increases is recorded in *Kalanchoe* (*Bryophyllum*) *Daigremontiana*, *K. Blossfeldiana*, *Salvia splendens*, *Malva sylvestris* and *Linum usitatissimum* (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 830). In 20 ornamental plants with double and single varieties, all having the same chromosome number, in every case the double forms had larger cells than the singles (cf. *Plant Breeding Abstracts*, Vol. XXI, Absts. 1587 and 2360).

84 D'Amato, F.
Endopolyploidy in differentiated plant tissues.
Caryologia 1952 : **4** : 115–17.

D'Amato, F.
New evidence on endopolyploidy in differentiated plant tissues.
Ibid 1952 : **4** : 121–44.

The first reference is a preliminary note on the investigations which are reported in detail in the second paper. Mitosis was stimulated in differentiated root tissues of *Muscari comosum*, *Tradescantia*, *Allium yunnanense* and other monocotyledons by treatment with sodium 2,4-dichlorophenoxyacetate. Both diploid and 4*n* and 8*n* mitoses were observed. The view is expressed that polyploidy in differentiated tissues is of the endopolyploid type; reasons are given for preference of the term endopolyploidy to polyteny. The author agrees with L. Geitler in regarding endopolyploidy as a general characteristic of differentiated tissues, and in a few cases has found that endopolyploidy preceded differentiation. Observations on centromere behaviour and relational coiling, and also on spontaneous chromosome aberrations are described. The frequency of aberrations appeared to be higher in polyploid than diploid nuclei. The possible role of metabolites or their derivatives in the production of aberrations in differentiated tissues is briefly discussed.

85 Gori, C.
Studio citologico dell'effetto mutageno della essenza di *Reseda*. (**A cytological study of mutagenic effect of the essence of *Reseda***).
Caryologia 1952 : **4** : 276–80.

Spontaneous chromosome aberrations were observed in the root mitoses of *Reseda odorata*. The essence of this species when tested on root meristems of *Allium Cepa* proved to have a low mutagenic effect, inducing chromosome breaks and translocations but no stickiness.

86 Gavaudan, P.
Étude quantitative de l'action mito-inhibitrice des substances aromatiques: définition et terminologie des effets cytologiques utilisés comme test. (**Quantitative study of the mito-inhibitory action of aromatic substances: definition and terminology of the cytological effects used for testing**).
CR Soc. Biol., Paris 1943 : **137** : 281–83.

The practice of taking colchicine and paradichlorobenzene as the types of two classes of substances with distinctive mitoinhibitory effects is criticized. Three stages in mitotic inhibition are distinguished: (1) tropocinesis, involving rotation of the spindle; (2) merostathmocinesis, in which anaphase is reached but with various aberrations; and (3) stathmocinesis, or complete mitotic inhibition.

87 Gavaudan, P. and Gavaudan, N.
Analogie entre les effets exercés sur la caryocinèse et la cytodiérèse végétales par le chloroforme et les substances aromatiques. (**Analogy between the effects exerted on plant caryocinesis and cytodieresis by chloroform and aromatic compounds**).
CR Soc. Biol., Paris 1943 : **137** : 509–10.

In many respects chloroform resembles various aromatic compounds in its effect on mitosis. Among the effects noted were tropocineses and merostathmocineses.

88 Quidet, P. and Hitier, H.
Obtention de plantes polyploïdes par traitement à l'hexachlorocyclohexane et au sulphure de polychlorocyclane. (**The production of polyploid plants by treatment with hexachlorocyclohexane and polychlorocyclane sulphide**).
CR Acad. Sci. Paris 1948 : **226** : 833–35.

Polyploidy has been induced in tobacco and the onion by means of the above two substances, which, it is thought, might be used instead of colchicine.

89 Gavaudan, P., Gavaudan, N. and Poussel, H.
Activité mito-inhibitrice de la plupart des fonctions dans la série aromatique opposée à l'activité pratiquement nulle ou réduite de la fonction carboxyle. (**Mitoinhibitory activity of the majority of radicals of aromatic compounds in contrast to the negligible or lowered activity of the carboxyl radical**).
CR Soc. Biol., Paris 1943 : **137** : 570–71.

Most aromatic compounds inhibit mitosis with the notable exception of carboxylic acids and their esters.

90 Gavaudan, P.
Analogie de la réaction tropocinétique provoquée dans le méristème radiculaire de blé par l'éther éthylique et les substances mito-inhibitrices de la série aromatique; rapport avec la narcose. (**Analogy of the tropocinetic reaction induced in the root meristem of wheat by ether and mitoinhibitory aromatic compounds; connexion with narcosis**).
CR Soc. Biol., Paris 1943 : **137** : 571–73.

Ether resembles chloroform in inducing tropocinesis in the root tips of wheat. The hypothesis that both substances are here acting as narcotics is considered.

91 Gavaudan, P. and Gavaudan, N.
Action du benzène et de ses homologues sur la caryocinèse et la cytodiérèse végétales. (**Action of benzene and its homologues on plant caryocinesis and cytodieresis**).
CR Soc. Biol., Paris 1943 : **137** : p. 50.

Benzene, toluene, propylbenzene, isobutylbenzene and p-cymene have induced such mitotic disturbances as tropocineses, multipolar spindles and irregular segregation in the root tips of *Triticum vulgare.*

92 Deysson, G. and Deysson, M.
Action du cholate de sodium sur le fonctionnement fusorial chez *Allium Cepa* L. (**Action of sodium cholate on the functioning of the spindle in *A. Cepa* L.**).
CR Acad. Sci. Paris 1950 : **230** : 121–23.

C-mitotic effects, without however the accompanying lethal action that follows prolonged treatment, have been obtained by subjecting the roots of *A. Cepa* to relatively high concentrations of sodium cholate for $\frac{1}{4}$–$\frac{1}{2}$ hour.

93 Rezende-Pinto, M. C. and Lemos-Pereira, A. de.
Acção da "astacina" sobre as mitoses dos meristemas radiculares de *Allium cepa* L. (**Action of astacine on the mitoses of root meristems of *A. cepa* L.**).
Bull. Soc. Portug. Sci. Nat. 1951 : **3** : 176–79.

The animal carotenoid astacin had no effect on resting nuclei but on dividing nuclei it produced results identical with those of colchicine.

94 Lemos-Pereira, A. de.
Sobre a acção carioclástica do sabão amigdalino nos meristemas radiculares de *Allium cepa* L. **(The caryoclastic action of amygdalin soap on the root meristems of *A. cepa* L.).**
Bull. Soc. Portug. Sci. Nat. 1951 : **3** : 172–75.

Injection of a 0·01% emulsion of amygdalin soap ultimately caused the nuclei to be completely homogenized.

95 Meletti, P.
Reazioni cito-istologiche ed effetti rizogeni in plantule di alcune Leguminose trattate con 2,4-D. **(Cytohistological reactions and rhizogenic effects in some Leguminous seedlings treated with 2,4-D).**
Nuovo G. Bot. Ital. 1950 : **57** : 499–514.

Cells with polyploid nuclei, the degree of polyploidy being sometimes as high as 16 *n*, have been detected in differentiated tissues of *Pisum sativum* and *Vicia Faba* by inducing mitosis with 2,4-D.

96 Pirschle, K.
Wasserkulturversuche mit polyploiden Pflanzen. I. *Stellaria media*. **(Water culture investigations with polyploid plants. I. *S. media*).**
Biol. Zbl. 1942 : **62** : 253–79.

The growth, fresh weight, dry weight and dry matter content of diploid and autotetraploid strains of *S. media* were compared after growth in (1) water cultures containing graded concentrations of standard nutrients and (2) standard water cultures in which the concentration of K, Ca or N was altered. In general, the diploid strain was superior to the tetraploid in the four characters studied except for the dry matter content of the root. Differential responses by the two strains to the various treatments were not important.

97 Pirschle, K.
Wasserkulturversuche mit polyploiden Pflanzen. II. *Stellaria media*; Einfluss von Spurenelementen. **(Water culture investigations with polyploid plants. II. *Stellaria media*; influence of trace elements).**
Biol. Zbl. 1942 : **62** : 455–82.

Continuing his investigations on diploid and autotetraploid strains of *S. media* (cf. Abst. 96), the author records the results of water culture experiments involving various concentrations of Fe, B, Mn, Cu, Zn and Al. The relative behaviour of the diploid and tetraploid strains was similar to that in the earlier experiments.

98 Becquerel, P.
La suspension de la vie des spores des bactéries et des moisissures desséchées dans le vide, vers le zéro absolu. Ses conséquences pour la dissémination et la conservation de la vie dans l'univers. **(Suspension of life in the spores of bacteria and moulds when desiccated in a vacuum at temperatures approaching absolute zero. The consequences in respect of the dissemination and conservation of life in the universe.)**
CR Acad. Sci. Paris 1950 : **231** : 1392–94.

Spores of bacteria and fungi have germinated after exposure to temperatures of 0·0075–0·047° K in a vacuum. It is thought, therefore, that such spores could survive indefinitely in interstellar space, provided they were shielded from lethal radiation.

99 Becquerel, P.
La suspension de la vie des algues, lichens, mousses aux confins du zéro absolu et rôle de la synérèse réversible pour leur survie au dégel expliquant l'existence de la flore polaire et des hautes altitudes. **(Suspension of life in algae, lichens and mosses at temperatures approaching absolute zero, and the role of reversible syneresis in enabling organisms to survive till thawing out, thereby explaining the existence of the polar and montane floras).**
CR Acad. Sci. Paris 1951 : **232** : 22–25.

Continuing his researches on the effects of extremely low temperatures on living organisms (cf. Abst. 98), the author reports that representative species of the above groups of plants can survive temperatures below 1° K. The protoplasmic changes associated with such low temperatures are described.

100 Wellensiek, S. J., Gorter, C. J., Verkerk, K. and Waterschoot, H. F.
Vegetative seed formation ?
Euphytica, Wageningen 1952 : **1** : 123–29.

With a view to the possible production of homozygous individuals for breeding purposes, E. von Tschermak's claim to have induced parthenogenesis by dusting stigmas with substances containing various growth-stimulating compounds was tested, using several fruit and vegetable crops. The results were negative. The divergent results are attributed to the lack of protection of the treated flowers from foreign pollination in von Tschermak's experiments.

101 Owczarzak, A.
A rapid method for mounting pollen grains.
Stain Tech. 1952 : **27** : 249–51.

A method is described for the rapid classification of pollen grains in studying sterility. The mounting medium consists of 50 ml. of glycerol jelly to which 2·5 ml. of methyl green and 2 ml. of phloxine, both in 50% alcoholic solutions, have been added. Prior to application of the jelly-dye mixture, the pollen is washed with 70% ethanol to remove adhering oils and resins.

*DISEASES, INJURIES, BACTERIA, FUNGI, VIRUSES

102 Kriviskiĭ, A. S.
(Changing the nature of microorganisms).
Priroda (Nature) 1952 : No. 2 : 66–73. [Russian].

An account is given of a conference, held in Moscow in 1951, on breeding and directing changes in microorganisms. The report is substantially the same as one which has been previously summarized in *Plant Breeding Abstracts* (cf. Vol. XXII, Abst. 2515).

103 Jinks, J. L.
Competitive suppression and the determination of linkage in microorganisms.
Nature, Lond. 1952 : **170** : 106–08.

The author refers to the criticism by G. W. Grigg of the assay method generally used to detect reverse mutants induced by radiation (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1678). Grigg based his criticism on experimental evidence of suppression of prototrophic backmutants of *Neurospora* by unchanged cells of the mutant strain. From the literature on microorganisms the present author cites evidence of a similar suppression of prototrophs that have arisen through recombination. The theoretical and practical significance of the Grigg effect in linkage analyses is discussed.

104 **Report of the Rothamsted Experimental Station, Harpenden, 1951** (1952) : 76–88.
Bawden, F. C. Plant Pathology Department.

The potato varieties Canso and Keswick (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1251), bred in Canada for resistance to late blight, developed blight after its appearance on surrounding plants of Majestic. The attacking strain was identified as a B form.

The investigations reported also include the study of six viruses of sugar beet. The "41" yellows virus was seed-transmitted in the sugar beet variety Kleinwanzleben E. In order to obtain information on possible relationships between "41" and IMS (Irish mild yellows), breeding experiments were initiated to determine whether IMS is also seed-transmitted in any sugar beet variety.

105 Atwood, K. C. and Stapleton, G. E.
Lethal mutations and the bactericidal action of ionizing radiation.
Naturwissenschaften 1952 : **39** : 330–31.

The reasoning used by Norman and Greenfield (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1647) to refute the possibility that the bactericidal action of ionizing radiation may be attributed to lethal mutation is shown to be based on an erroneous assumption. Cytological and genetic evidence (cf. Abst. 5) indicates that in rod-shaped bacteria both daughter nuclei from one dividing nucleus are included in the same daughter cell. Thus induced mutations become homocaryotic after a few divisions, the number of divisions depending on the number of nuclei present. A recessive lethal mutation at a single locus is therefore ultimately capable of causing inactivation of a multinucleate cell. In attempting to correlate the nuclear constitution with the survival curve the possibility of interaction between nuclei is discussed, and it is pointed out that more than one unit within the same cell may be affected by diffusible products of a single ionizing particle.

106 Devi, P., Pontecorvo, G. and Higginbottom, C.
Mutations affecting the nutritional requirements of *Aerobacter aerogenes* induced by irradiation of dried cells.
J. Gen. Microbiol. 1951 : **5** : 781–87.

Following irradiation of dried *Ae. aerogenes* by X rays, 24 mutant forms were isolated, indicating that X rays are mutagenic when cells are in a dormant phase (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 117). Some 15 mutants differed from the parent strain in respect of specific growth requirements, but several eventually grew without these growth factors after a lag period of more than 24 hr. The lag phase has been attributed to the occurrence of selection subsequent to mutation.

---

* General studies, see also individual crops.

107 Stapleton, G. E., Billen, D. and Hollaender, A.
The role of enzymatic oxygen removal in chemical protection against X-ray inactivation of bacteria.
J. Bact. 1952 : **63** : 805–11.

Conditions affecting the protection afforded by chemicals against the lethal influence of X rays on *Escherichia coli* are discussed. The protection afforded by amino and carboxylic acids showed a decrease with decreasing rate of respiration. Cells having an active dehydrogenase system were more resistant to X rays when irradiated in a mixture of hydrogen and oxygen than if irradiated in a nitrogen-oxygen mixture. Production of a highly reduced state within cells containing active hydrogenase by exposure to 100% hydrogen had no effect on X ray resistance. Thus it appears that oxygen removal rather than donation of hydrogen is the principal mechanism by which chemicals give protection (cf. Abst. 5).

108 Rothfels, K. H.
Gene linearity and negative interference in crosses of *Escherichia coli.*
Genetics 1952 : **37** : 297–311.

The linear sequence of the following five linked loci has been found to be *M*, *Lac*, V_1, *L* and *T*. An apparent excess of multiple crossovers, relative to segmental crossover frequencies, is explained as being probably due to an excess of noncrossovers resulting from irregular and incomplete pairing; the possibility of negative interference in completely paired chromosome regions is not however ruled out.

109 Lindenbein, W.
Art und Artkonstanz bei bodenbewohnenden Strahlenpilzen. (**Species and the constancy of species in soil inhabiting Actinomycetes**).
Ber. dtsch. bot. Ges. 1951 : **64** : Generalversammlungs-Heft : 32–33.

A study of variability and the validity of the chemical nature of the pigmentation effects as distinctive characters in about 1000 strains of saprophytic forms of *Streptomyces*, from soil samples taken in Europe and elsewhere, showed that the formation of a particular pigment might be regarded as characteristic of certain forms, and not of others. The possibility that such differences are due to mutations must be considered in the light of Badian's views on the heterozygosity of many strains.

110 Dean, A. C. R. and Hinshelwood, C.
The resistance of *Bact. lactis aerogenes* to proflavine (2:8-diaminoacridine). I. The applicability of the statistical fluctuation test.
Proc. Roy. Soc. 1952 : **139** : Ser. B : 236–50.

Using the experimental technique devised by Luria and Delbrück (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 486) to differentiate between the hypotheses of adaptation and spontaneous mutation, it was shown that variance in respect of the number of proflavine resistant cells was greater with samples taken from different cultures than with samples from a single culture. This corresponds with the expected randomness of spontaneous mutation. It has, however, been shown that variability between cultures is also caused by factors other than spontaneous mutation, such as age, pH and degree of aeration, which may vary slightly in separate cultures. Evidence has also been obtained of competition between the rate of development of resistance and the death rate of the population. The time at which the last surviving cell can be detected in a proflavine culture shows considerable variation. Thus the difference between the number of resistant colonies in several cultures is considered to be a function of survival rather than of mutation.

111 Baskett, A. C.
The resistance of *Bact. lactis aerogenes* to proflavine (2:8-diaminoacridine). II. The direct induction of adaptation.
Proc. Roy. Soc. 1952 : **139** : Ser. B : 251–62.

By slowly adding proflavine in amounts insufficient in themselves to arrest growth, cultures were gradually accustomed to increasing concentrations of the inhibitor and were able to tolerate conditions which usually result in complete inhibition. Cultures became adjusted to high concentrations of proflavine in too short a period for appreciable selection of resistant mutants to have occurred. From observations on the formation of filaments it was apparent that all cells were able to modify their enzyme systems in order to respond to the changing environment. It is therefore concluded that interaction between the bacteria and proflavine has greater influence on the survival of colonies than the selection of spontaneously occurring resistant mutants.

112 BRAUN, W., KRAFT, M., MEAD, D. M. and GOODLOW, R. J.
The effect of penicillin on genetic changes and temporary modifications in populations of brucellae.
J. Bact. 1952 : **64** : 41–47.

Rapid population changes, involving the establishment of nonsmooth mutants in originally smooth cultures, occurred when penicillin resistant cells of *Brucella suis, B. abortus* and *B. melitensis* were transferred through a series of broth cultures containing increasing concentrations of penicillin. Using a penicillin resistant mutant of *B. melitensis* which is unique in respect of failure to accumulate alanine in penicillin-free media, it has been possible to show that population changes in the presence of penicillin are associated with the accumulation of alanine in the culture medium; such accumulation creates an environment favouring the establishment of nonsmooth mutants with increased resistance to alanine (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts. 105 and 2477).

An additional effect of penicillin on colonial morphology was also noted. Smooth penicillin-resistant individuals assumed nonsmooth characteristics when grown in a medium containing penicillin, but reverted to the smooth form when penicillinase was added to remove the effect of the penicillin.

These results indicate that similar phenotypes may be produced by spontaneous genetic mutation or by temporary modifications induced by environmental factors.

113 RYAN, F. J.
Adaptation to use lactose in *Escherichia coli.*
J. Gen. Microbiol. 1952 : **7** : 69–88.

By plating a strain unable to use lactose (lac$^-$) on an indicator of eosin methylene blue agar, the rate of spontaneous mutation to lactose utilization (lac$^+$) was shown to be 2 x 10^{-7} per bacterium per generation; this rate was not influenced by lactose or other related substances. Both lac$^-$ and lac$^+$ bacteria contain a similar amount of β-galactosidase, but in the presence of lactose only lac$^+$ variants can form lactose and make use of the substrate; thus a small number of mutants have a selective advantage in a lactose medium. Differential growth of young lac$^+$ and lac$^-$ colonies on lactose facilitates recognition of lac$^+$ colonies 16–18 hours after plating. These results are discussed in connexion with Hinshelwood's arguments against the hypothesis of adaptation by mutation (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 838), and, in relation to the possible specific mutagenic activity of compounds with a close chemical affinity to lactase.

114 TAYLOR, H. E.
Transformations réciproques des formes R et ER chez le pneumocoque. (**Reciprocal transformations of the R and ER forms in pneumococcus**).
CR Acad. Sci. Paris 1949 : **228** : 1258–59.

The pneumococcal transformation R $\rightleftharpoons$ ER has been shown to be reversible, using appropriate desoxyribose nucleic acid inductors.

115 **Symposium on the biology of bacterial spores.**
Bact. Rev. 1952 : **16** : 89–143.

Several of the papers presented are of interest to geneticists. The biological role of spores is discussed by C. Lananna, with reference to the absence of evidence for sexual processes; data on mutations induced by ultraviolet and X irradiation are interpreted to mean that both vegetative cells and endospores are uninucleate and probably haploid. G. Knaysi gives cytological details of sporulation and provides evidence of the division of bodies resembling chromosomes. The concept that cellular factors influence the response of an organism to its environment is supported by the work of C. F. Schmidt concerning the effect of serial transfer on media other than nutrient agar. Two papers by H. R. Curran and H. Sugiyama deal with the influence of environment on the resistance of bacterial spores. Data on the death rate of spores exposed to high temperatures are examined by H. Reynolds and H. Lichtenstein; there is an initial acceleration and a marked decrease as the point of complete destruction is reached. The sigmoid curve thus produced is characteristic of a population composed of individuals possessing varying degrees of resistance.

116 SCALETTI, J. V., CLEVERDON, R. C. and NEWCOMER, E. H.
Orcein stain for bacterial chromatinic material.
J. Bact. 1952 : **64** : 183–86.

The orcein-carmine staining technique, regarded as cytogenetically specific for nuclear structures in cells of higher plants and animals, has revealed structures believed to be chromatinic in *Bacillus cereus*, *B. megaterium* and *Escherichia coli;* similar structures were not, however, visible in *Azotobacter chroococcum*. The structures correspond to those previously detected by other histochemical methods and are considered to be nuclear in nature.

117 BISSET, K. A.
The evidence for mitotic spindles in bacteria.
Science 1952 : **116** : 154–55.

DeLamater's claim of having demonstrated mitotic spindles in bacteria is regarded as invalid (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts 115, 940 and 1658).

118 GOLDSTEIN, A.
Effect of penicillin on streptomycin-dependent variants in *Escherichia coli*.
Science 1952 : **116** : 113–15.

With implantation upon agar containing streptomycin, the number of streptomycin dependent (D) colonies appearing is approximately proportional to the total viable count of the implant under normal conditions. After exposure to penicillin, however, the number of D colonies decreases much less than the total viable count. It is suggested that D bacteria may be present in a normal population before contact with streptomycin, as a result of spontaneous mutation. Their relative insensitivity to penicillin would result from their poor growth in the absence of streptomycin. An alternative explanation would be that the precursors of D cells are present in a normal population, that these are relatively insensitive to penicillin, and that they only give rise to D colonies by an adaptive process after transfer to a medium containing streptomycin. Experiments are being carried out to distinguish between these alternatives.

119 PETERSON, A. and POPE, H.
A comparison of the synthesis of vitamins and amino acids by *Mycobacterium tuberculosis* and its streptomycin resistant variant.
J. Bact. 1952 : **64** : 15–28.

Both the streptomycin susceptible strain H37Rv and its resistant variant, H37Rv–SR, were found to synthesize nine vitamins of the B complex and ten aminoacids in measureable amounts. A slight decrease in the ability of H37Rv–Sr to synthesize inositol was observed, otherwise both strains produced similar quantities of vitamins. Streptomycin resistance was however associated with an increased production of leucine, isoleucine and valine, whereas synthesis of histidine and tryptophane was slightly less in H37Rv–SR than in H37Rv.

120 VOUREKA, A., and OGILVIE, A. C.
Toxin production in two strains of *Staphylococcus* and their variants.
J. Gen. Microbiol. 1952 : **7** : 48–53.

Four variants obtained from two virulent strains of *S. aureus* by exposure to chloramphenicol and terramycin (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2487) have lost the ability to produce three virulent toxins, α-haemolysin, leucocidin and a dermonecrotic toxin.

121 BRYSON, V. and SZYBALSKI, W.
Microbial selection.
Science 1952 : **116** : 45–51.

The authors give a joint discussion of the various agents which exert selection pressures upon microorganisms, the origin and pattern of resistance, and methods of isolating resistant strains, with particular reference to selection of bacterial mutants resistant to antibiotics.

W. Szybalski describes the gradient plate technique for the study of bacterial resistance, and V. Bryson the turbidostatic selector, a device for the automatic isolation of bacterial variants. The latter apparatus has several potential uses, e.g. it can facilitate study of the relative importance of adaptation and selection of mutants as factors in adjustment to a toxic environment, mutation rate, modified resistance in populations undergoing little or no multiplication, and the derivation of partial or multiple-step reverse mutants.

122 BAER, B. S. and KRUEGER, A. P.
The *B. mycoides* N host-virus system. I. Differences in appearance and "rate of growth" of the lysogenic and parent indicator strains.
J. Gen. Physiol. 1952 : **35** : 857–64.

Comparisons between growth characteristics of the lysogenic mutant strain N of *Bacillus mycoides* and the nonlysogenic parent show that on agar the mutant spreads at a slower rate than the parent and forms smaller colonies; in broth the mutant forms clumps whereas the nonlysogenic strain grows diffusely throughout the medium. It is suggested that the mutant has a longer generation period than the parent; clumping favours active phage multiplication and lysis, and rapidly exhausts the supply of nutrients in the vicinity, thus further reducing the rate of bacterial reproduction.

123 Hughes, W. H.

The genetic significance of certain L-forms of *Bacterium coli*.

J. Gen. Microbiol. 1952 : **7** : p. iv. (Abst.)

Studies of variation in populations derived from a single cell (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1660) have been continued, using a strain of *B. coli* which produces 80% normal colonies, 3% L-forms and 16% consisting of both types. In the latter, the first division appeared to be normal but the daughter cells reacted differently in the same environment; one continued to divide normally but division was suppressed in the other, giving rise to an L-form. From a mixed culture single cells of both types were isolated; the proportion of L-forms increased in the progenies of selected L-forms, whereas normal cells produced cultures with fewer L-forms than the original strain.

124 Mirzabekjan, P. O.

(The effect of antagonistic micro-organisms and their antibiotic products upon several organisms causing bacterial diseases of agricultural plants).

Doklady Vsesojuz. Akad. Seljsk. Nauk. im. V.I. Lenina (Proc. Lenin Acad. Agric. Sci. USSR) 1952 : No. **5** : 34–38. [Russian].

In Armenia several races of *Actinomyces* antagonistic to *Bacterium armeniaca*, *B. malvacearum* and *B. citriputeale* have been selected. Artificial infection of apricot and peach trees with strain 15 or 15 (n) controlled *B. armeniaca* under orchard conditions. These strains also suppressed the development of *B. malvacearum* on cotton and of *B. citriputeale* on citrus fruits.

125 Bryson, V. and Davidson, H.

Spontaneous and ultra-violet-induced mutations to phage resistance in *Escherichia coli*.

Proc. Nat. Acad. Sci., Wash. 1951 : **37** : 784–91.

Spontaneous and ultraviolet-induced mutants of strain B/r differed both quantitatively and qualitatively. In the spontaneous group the proportion of mutants resistant to bacteriophage T1 but sensitive to T5 was 44%; in the induced group only 8% such mutants were obtained. Two outstanding qualitative differences were detected. Mutants requiring a supplementary growth factor other than tryptophane were found in the induced series. On the other hand, all patterns of phage resistance, apart from the common patterns B/r/1 and B/r/1,5, arose spontaneously. Another difference between the spontaneous and induced populations resided in the proportion of mutants exhibiting partial resistance to T1, such resistance being found much more frequently among the induced mutants.

126 Lwoff, A.

Lysogenic bacteria. II.

Endeavour 1952 : **11** : 132–36.

Details are given of treatments, including ultraviolet and X irradiation and exposure to various chemical reducing agents, which have induced the formation of bacteriophage from probacteriophage in *Bacillus megatherium*, with subsequent lysis. It is assumed that bacteria which can liberate phages have undergone mutation so that a specific metabolite capable of conferring a lethal effect on a formerly non-pathogenic particle is synthesized (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2502).

The origin and significance of probacteriophage is discussed, with special reference to the theory that it is a phylogenetically primitive form of the bacteriophage and that it arose endogenously by a plasmagene mutation.

127 Hepting, G. H., Toole, E. R. and Boyce, J. S. (Jun.).

Sexuality in the oak wilt fungus.

Phytopathology 1952 : **42** : 438–42.

The occurrence of the perithecial phase (*Endoconidiophora Fagacearum*) has been studied in 30 isolates of *Chalara quercina* from the southern Appalachians. Two compatibility types, designated A and B, were apparent; each isolate formed perithecia with either type A or type B but never with both, indicating a heterothallic condition. Spermatizing experiments with single conidial isolates of opposite compatibility showed that all types were capable of acting as either male or female individuals.

Several isolates from one of the trees produced perithecia when plated alone, whereas all other isolates were self sterile. The behaviour of single spore cultures of the apparently self fertile isolates revealed, however, that the original isolates were mixtures composed of both compatibility types.

128 Pontecorvo, G.

Non-random distribution of multiple mitotic crossing-over among nuclei of heterozygous diploid *Aspergillus*.

Nature, Lond. 1952 : **170** : 204–05.

Evidence of mitotic crossing over in diploid nuclei of *A. nidulans* and *A. niger* has been obtained. Detailed analysis of mitotic recombinants of *A. nidulans* has further shown that the crossing over tends to be concentrated in a small proportion of the nuclei.

129 PONTECORVO, G. and ROPER, J. A.
Genetic analysis based on mitotic crossing-over in heterozygous diploids of *Aspergillus nidulans.*
Heredity 1952 : **6** : 280–81. (Abst.)

Somatic crossing over and segregation were observed in several artificially-induced heterozygous diploids (cf. Abst. 130), and genetic analyses were carried out, using the mitotic crossover values to determine the positions of certain loci, including the centromeres. These data have been compared with genetic analyses based on sexual reproduction, and agreement has been established using both methods. Thus a technique for mapping chromosomes of fungi lacking a sexual phase is now available provided (*a*) it is possible to induce the formation of heterozygous diploid nuclei, and (*b*) these nuclei undergo mitotic crossing over.

The high frequency of somatic crossing over in *A. nidulans* indicates that it is a more fundamental feature of chromosome duplication than has hitherto been supposed. It is suggested that where the diploid phase extends over most of the life cycle a mechanism was probably evolved to reduce the frequency of crossing over at mitosis, so that crossing over has become confined to meiosis.

130 ROPER, J. A.
Production of heterozygous diploids in filamentous fungi.
Experientia 1952 : **8** : 14–15.

A heterocaryon between a lysine requiring strain of *Aspergillus nidulans* having yellow conidia and another haploid strain requiring adenine and having white conidia was treated with d-camphor vapour for 5 hours; conidia produced after treatment were plated on a medium lacking both lysine and adenine. Only a few colonies with green conidia, requiring neither growth factor, developed; these proved to be diploid and heterozygous. This technique has consistently proved successful in the production of diploids heterozygous for known genetic markers.

131 SHENG, T. C. and SHENG, G.
Genetic and non-genetic factors in pigmentation of *Neurospora crassa.*
Genetics 1952 : **37** : 264–69.

Four colour types, viz. salmon (wild type), pink, peach and albino, were found to have the genetic constitution *CI*, *Ci*, *cI* and *ci*, respectively, *C* being a major gene for production of carotenoid pigment and *I* an intensifier. Evidence was obtained that phytofluene is the precursor of carotenoid pigment, and that the genetic block associated with *c*, *i* and another gene for the albino condition, al_1, occurred before the formation of phytofluene.

132 HASKINS, F. A. and MITCHELL, H. K.
An example of the influence of modifying genes in *Neurospora.*
Amer. Nat. 1952 : **86** : 231–38.

Several strains utilizing tryptophane or nicotinic acid have in common a primary mutation which prevents their growth on minimal medium. The responses of these strains to various growth substances are however influenced by the action of a number of modifying genes, which cause blocks in the different biosynthetic steps along the pathway leading to the formation of tryptophane or nicotinic acid. A suppressor of the primary mutant gene has also been discovered.

133 LEIN, J. and LEIN, P. S.
Studies on a suppressor of non-allelic acetate-requiring mutants of *Neurospora.*
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 44–48.

Three mutants requiring acetate for growth were nonallelic, according to the results of heterocaryon and genetical tests. In one of these strains a mutant suppressor gene arose which partially relieved the acetate requirement of all three strains. Evidence was obtained in support of the hypothesis that the suppressor gene made acetate synthesis possible by opening up a pathway ordinarily blocked by the presence of glucose.

134 MITCHELL, M. B. and MITCHELL, H. K.
Observations on the behaviour of suppressors in *Neurospora.*
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 205–14.

A suppressor (*s*) of the pyrimidineless mutant *pyr 3a* and some aspects of the behaviour of the suppressed mutant have been previously described (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 123). The present paper gives a detailed analysis of the growth responses of recombinants from crosses of *pyr 3a–s* with prolineless, ornithineless or citrullineless mutants. The prolineless mutants *prol* 2, 3 and 4 were suppressed by *s*. The three suppressed mutants were indistinguishable from the wild type on minimal medium and were not affected by additional proline or arginine. In combination with any of the genes responsible for the ornithineless and citrullineless mutants, *s* had an inhibitory effect which may be considered the opposite of suppression; apparently *s* converted these mutants into strains with absolute requirements for citrulline or arginine. The suppressor *s* did not however appear to belong to a different category from any of the other mutant genes, since, for example, *pyr 3a* had an inhibitory effect on citrulline utilization and the ornithineless mutants behaved as suppressors of *pyr 3a*. The shifting of the position of the genetic block, as shown by the action of *s* and *pyr 3a* upon ornithineless, citrullineless and lysineless mutants (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 833), suggests that the relationship between mutation and nutritional requirement may not always be as direct as it is sometimes thought to be. The data further suggest that response to the same suppressor cannot be accepted as proof of allelism.

135 Mitchell, M. B., Pittenger, T. H. and Mitchell, H. K.
Pseudo-wild types in *Neurospora crassa.*
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 569–80.

There is as yet no conclusive evidence that three pyrimidine requiring mutants, *pyr–3a*, *pyr–3b* and *pyr–3d*, are nonallelic (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 123). Phenotypically wild strains have been obtained from crosses between *pyr–3d* and *pyr–3b*, but not from crosses between *pyr–3a* and *pyr–3b*, suggesting that *pyr–3a* and *pyr–3d* differ in some way. Data are presented on the performance of phenotypically wild progeny in numerous crosses in comparison with standard wild strains. Some 45% of the offspring resulting from crosses between pseudowild and standard wild strains were pyrimidineless mutants.

136 Yanofsky, C.
The effects of gene change on tryptophan desmolase formation.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 215–26.

Two allelic mutants of *Neurospora* requiring tryptophane lacked tryptophane desmolase, the enzyme which catalyses tryptophane synthesis from indole in strains of the wild type. One of the mutants (S–1952) was however capable of forming active tryptophane desmolase when it carried a specific suppressor gene. This suppressor gene did not affect the other tryptophaneless mutant (C–83). It is suggested that the alleles for tryptophane requirement may be qualitatively different forms of the same gene.

137 Haddox, C. H.
The accumulation of α-phenylglycine by mutants of *Neurospora crassa* stimulated by phenylalanine and tyrosine.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 482–89.

Although two mutants UT 39 and UT 4, differing from the wild type by a single gene, require phenylalanine or tyrosine for optimal growth, it has been found that on minimal media α-phenylglycine accumulates for a preliminary period and subsequently appears to be taken up in place of the other aminoacids. The sudden increase in growth of the mutants after a few days suggests that an enzyme system, at first inefficient in the utilization of α-phenyl- glycine, has become slowly adapted to this substance.

138 Bonner, D. M., Yanofsky, C. and Partridge, C. W. H.
Incomplete genetic blocks in biochemical mutants of *Neurospora.*
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 25–34.

By means of tracer atoms and measurement of the accumulation of specific intermediate compounds by double mutants, genetic blocks for formation of niacin or tryptophane were found to be incomplete (cf. Abst. 5).

139 Markert, C. L.
Radiation-induced nutritional and morphological mutants of *Glomerella.*
Genetics 1952 : **37** : 339–52.

Analyses have shown that three main classes of mutants, involving changes in morphology, pigmentation or growth rate, occur in similar proportions following irradiation of A^1B^1 conidia (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1680) by either fast neutrons, or ultraviolet or X rays; no qualitatively distinct types were observed with changing dosage. Reversion to wild type, A^+B^+, was three times as frequent among ultraviolet-induced mutants as among those resulting from ionizing radiations; this suggests that the physical or chemical changes induced in the gene by ultraviolet light are less stable than comparable changes produced by ionizing radiations, although the genetic effects on the physiology of the organism may be indistinguishable.

Specific nutritional requirements of 75 mutants have been determined; there is a continuous gradation in synthetic ability between mutants unable to grow on minimal medium and those with normal growth; most nutritionally deficient mutants continue to grow, if only feebly. It is therefore assumed that the mutant gene influences some basic synthetic mechanism controlling many of the cell's metabolic activities, instead of determining synthesis of a simple metabolite.

The relative stabilities of genes controlling biochemical syntheses in *Glomerella*, *Neurospora* and *Salmonella* are compared.

140 DOUDNEY, C. O. and WAGNER, R. P.
Threonine inhibition in a strain of *Neurospora*.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 196–205.

Mutant UT 77, induced by ultraviolet light, shows the wild type of growth on minimal medium at 35° C, but is strongly inhibited by l-threonine. The threonine inhibition, which is due to a single gene mutation, is completely overcome by methionine, homocysteine, homoserine and sulphanilamide, and partially overcome by choline. The mutant is also inhibited by choline but to a lesser degree than by threonine; the choline inhibition is relieved by thiamin. The possible bearing of these results upon the elucidation of the nature of genetic blocks is analysed.

141 KEITT, G. W.
Inheritance of pathogenicity and some other characters in *Venturia inaequalis*.
Advanc. Sci., Lond. 1952 : **9** : No. 33 : 39–44.

The progress of research on the origin and degree of stability of physiological races with different pathogenic properties is reviewed, with reference to the suitability of *V. inaequalis* for these studies. Particular attention is given to the action of gene pairs which condition the pathogenic reaction to particular apple varieties; four such gene pairs have already been established, but there has as yet been no evidence of linkage, except in connexion with characters other than pathogenicity (cf. *Plant Breeding Abstracts*, Vol. XXI, Absts 1638 and 2111).

142 HAAS, F., MITCHELL, M. B., AMES, B. N. and MITCHELL, H. K.
A series of histidineless mutants of *Neurospora crassa*.
Genetics 1952 : **37** : 217–26.

Experiments have been carried out on the biochemical behaviour and genetics of seven histidine-requiring mutants. No compound other than histidine was found to be active in promoting growth, but the mutants differed in the amount of histidine they required. Growth of the mutants was inhibited, even in the presence of histidine, when mixtures of certain aminoacids were added to the medium. The mutants involved three different linkage groups and four distinct loci. Five of the mutants accumulated biologically inactive compounds which appeared to be imidazole derivatives and differed according to the mutant concerned. Double histidineless mutants were isolated from intercrosses of single mutants; data on their behaviour provide the basis of a hypothesis on the sequence of biochemical reactions corresponding with the series of single mutants.

143 BERDACOU, J.
Mutation de *Nectria galligena* traité par l'hétéroauxine. (**Mutation in *N. galligena* following treatment with heteroauxin**).
CR Acad. Sci. Paris 1951 : **232** : 1230–32.

Apparently permanent changes in the morphology of a culture of *N. galligena* have been induced by treatment with heteroauxin.

144 POMPER, S.
A pH-sensitive multiple mutant of *Saccharomyces cerevisiae*.
J. Bact. 1952 : **64** : 353–61.

An ultraviolet-induced mutant, 62–28, requiring pantothenic acid, p-aminobenzoic acid, methionine, adenine and histidine, has been able to grow when increased concentrations of p-aminobenzoic acid have replaced the four other growth requirements. This suggests that a single major biochemical deficiency, affecting p-aminobenzoic acid metabolism, characterizes the mutant, and that syntheses of the other requirements are related to p-aminobenzoic acid. Ascospores from crosses involving mutant 62–28 are characterized by low percentage germination and survival, so that precise analysis of the genetic status of the mutant has been impossible. The genetic data available, however, do not support the possibility that a single mutant gene is responsible for blocking p-aminobenzoic acid synthesis. Some evidence of a more complex genetic system has been obtained from analyses of the growth requirements of progeny of a cross between a derivative of 62–28 independent of all five growth factors and an unrelated strain.

145 CHEN, S. -Y.
Sur une nouvelle technique de croisement des levures. (**On a new technique for crossing yeasts**).
CR Acad. Sci. Paris 1950 : **230** : 1897–99.

The technique involves the placing of one drop from each of the two haploid cultures to be crossed in a hanging drop chamber together with a series of separate droplets of the culture medium. Individual spores from each of the parent cultures can then be isolated by means of a micromanipulator and brought together in one or other of the droplets of the culture medium, where their fusion can be followed under the microscope.

146 Pomper, A.
Purine-requiring and pyrimidine-requiring mutants of *Saccharomyces cerevisiae*.
J. Bact. 1952 : **63** : 707–13.

Analyses of progenies resulting from crosses between seven adenineless mutants have revealed five distinct genetic types (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 142). Segregation data from crosses with other stocks show that at least four of the mutations were due to single gene changes; the fifth mutant is more complex.

Two mutants requiring uracil were shown to be nonallelic; these also arose as single gene mutations. Double mutants were obtained by crossing both mutant types, but no quantitative differences, in respect of growth requirements, were detected between the double and single mutants. It is suggested that both single mutants represent a block in either a single series of reactions or in reactions leading to the same product.

147 Ranganathan, B. and Subramaniam, M. K.
Studies on the cytology of yeasts. VI. Lethal chromosomal mutations in yeasts.
J. Indian Inst. Sci. 1952 : **34** : 235–51.

Further investigations of abnormal mitotic behaviour in a 4-chromosome distillery yeast (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1655) are concerned with mutants having unbalanced chromosome complements. Although most of these hexaploids, pentaploids and triploids eventually undergo pycnosis and complete degeneration, many persist in culture for variable periods. Chromosomes of all three types may also segregate without chromatid formation, resulting in a progressive reduction in chromosome complement, but usually the combinations of chromosomes in tetraploids or diploids produced in this way prove nonviable. Regular mitoses were, however, observed in some diploids immediately after their formation; although this suggests that particular genetic constitutions are viable, attempts to isolate stable diploids failed. It is therefore assumed that nonlethal diploids are readily transformed into tetraploids by spontaneous somatic doubling, owing to the presence of a mutant allele inherited from the tetraploid distillery strain. Such spontaneous doubling of the chromosome complement confirms the belief that the 4-chromosome distillery yeast is an autotetraploid.

These observations indicate the possible heterogeneity of a population at any one time which is sufficient to confuse the segregation ratios of hybridization experiments undertaken to elucidate the genetic behaviour of yeasts.

148 Bartholomew, J. W. and Mittwer, T.
Cellular structure as revealed by ultraviolet photolysis and the electron microscope.
J. Bact. 1952 : **64** : 1–8.

During irradiation studies at the University of California, Los Angeles, the exposure of bacterial and yeast cells, in suspension or as dried smears, to ultraviolet light was found to result in an increased transparency to electron beams. Cytological observations were therefore carried out on material which formerly appeared opaque under the electron microscope. Micrographs are given showing the internal structure of *Saccharomyces cerevisiae;* the nuclear vacuole is clearly differentiated, having a structure typical of nuclei of higher organisms with a distinctive nucleolus.

149 Ogur, M., Minckler, S., Lindegren, G. and Lindegren, C. C.
The nucleic acids in a polyploid series of *Saccharomyces*.
Arch. Biochem. Biophys. 1952 : **40** : 175–84.

The desoxyribonucleic acid (DNA), ribonucleic acid (RNA), dry matter and metaphosphate contents per cell were determined in a series of yeasts ranging from haploidy to tetraploidy. The DNA content was found to have an integral relationship with chromosome number and to be the most reliable indication of the number of chromosome sets present. Dry matter, RNA and metaphosphate contents per cell also increased with chromosome number but their range of experimental variation was greater than in the case of DNA content. The estimation of chromosome number by means of chemical criteria should prove valuable in the analysis of irregular segregation of yeasts, to ascertain how far polyploidy may be responsible for irregularities.

150 CALDAS, L. R. and CONSTANTIN, T.
Courbes de survie de levures, haploïdes et diploïdes soumises aux rayons ultraviolets. (**Survival curves of haploid and diploid yeasts following treatment with ultraviolet rays**).
CR Acad. Sci. Paris 1951 : **232** : 2356–58.

The survival curve of diploid strains of *Saccharomyces cerevisiae* is sigmoid, while the corresponding curve for the haploids is exponential, cutting the former curve at a point corresponding to 17% survival at a dose of 300 ergs/mm². Thus, with weak doses, the diploids are the more resistant, while with strong doses the situation is reversed.

151 SARACHEK, A., LUCKE, W. H. and LINDEGREN, C. C.
The relation of polyploidy to radiation response as determined by the analysis of ultraviolet survival curves of *Saccharomyces*.
Nuclear Sci. Abstr. 1952 : **6** : Abst. 4356. (Abst.).

Data have been obtained which give support to a multihit theory of direct cellular inactivation by ultraviolet irradiation. Analysis of the relationship between multiple sets of chromosomes in polyploid yeasts and survival curves after irradiation has shown that in each cell a single nongenic target sensitive to ultraviolet radiation is present, which increases in size as the number of chromosome sets increases. Mating appeared to involve fusion of the targets in the gametes. Induction dose and rate of logarithmic inactivation were established as two relatively independent but measurable indices of sensitivity.

152 PALLERONI, N. J., SHEFFNER, A. L. and LINDEGREN, C. C.
The absence of preadaptive oxidation of galactose by strains of *Saccharomyces*.
Arch. Biochem. Biophys. 1952 : **40** : 22–27.

Further information is given on experiments indicating the absence of preadaptive oxidation of galactose (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2519).

153 WINGE, Ö.
The genetic situation concerning fermentation in yeasts.
Heredity 1952 : **6** : 263–69.

A survey is given of research carried out to determine the general principles of inheritance of fermentative ability (cf. *Plant Breeding Abstracts*, Vol. XXI, Absts 856 and 1652 and Vol. XXII, Absts 2513 and 2520).

154 HESTRIN, S. and LINDEGREN, C. C.
Carbohydrases in *Saccharomyces* haploid stocks of defined genotype. II. Gene-controlled induction of glucosidases by α-glucosides.
Arch. Biochem. Biophys. 1952 : **38** : 317–34.

A more detailed account is given of data briefly presented in a former paper (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 974).

155 SPIEGELMAN, S. and DELORENZO, W. F.
Substrate stabilization of enzyme-forming capacity during the segregation of a heterozygote.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 583–92.

Segregation with respect to the capacity to produce galactozymase has been studied in the progeny of a diploid heterozygote (Gg_s) derived from crosses and back crosses between *Saccharomyces Chevalieri* and *S. cerevisiae*. Unadapted heterozygotes yielded a ratio of 1 positive : 1 negative offspring when plated on galactose (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2136). When heterozygotes were previously adapted by growing for 24 hr. on a galactose medium, however, 90% of the asci produced spores with galactose-positive phenotypes. These data are explained in terms of cytoplasmic elements, necessary for enzyme formation, which are produced in the presence of galactose and the dominant gene *G*. If the cytoplasmic elements are incorporated into spores with a g_s genotype, the phenotype is converted to galactozymase synthesis. The abrupt reversion of such galactose-positive cultures to the negative phenotype in a substrate-free medium is in agreement with previous studies (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 859), which have indicated that the cytoplasmic elements are not reproduced in the absence of galactose.

156 PRIDHAM, T. G. and RAPER, K. B.
Studies on variation and mutation in *Ashbya gossypii*.
Mycologia 1952 : **44** : 452–59.

In view of the economic potentialities of *A. Gossypii* as a source of riboflavin, investigations were carried out on natural variations and on mutants induced by treatment with ultraviolet light, X rays and CH_3-bis-β-chloroethylmethylamine. All three mutagenic agents tended to induce degenerate types with decreased riboflavin synthesis. The nitrogen mustard compound also led to the isolation of stable mutants characterized by nutritional deficiencies. Some of the substrains showed an unsustained ability to produce greater amounts of riboflavin than the parent strain. Valuable information has been gained concerning practical problems of riboflavin production. The failure to isolate stable superior substrains is not regarded as indicating the impossibility of securing such variants.

157 FOWELL, R. R.
Sodium acetate agar as a sporulation medium for yeast.
Nature, Lond. 1952 : **170** : p. 578.

Using a medium consisting of 0·3–0·5% anhydrous sodium acetate and 1·5% agar, 40% sporulation of *Saccharomyces cerevisiae* has often been obtained. In the case of all the yeasts tested this medium has provided a consistently high proportion of 4-spored asci: its use should therefore be valuable in genetical studies.

158 AHMAD, M.
Single-spore cultures of heterothallic *Saccharomyces cerevisiae* which mate with both the tester strains.
Nature, Lond. 1952 : **170** : 546–47.

The occurrence of single-spore cultures which can conjugate fully with the cells of other cultures, regardless of the + and — compatibility system, has been interpreted by Lindegren and Lindegren on the basis of loss of discriminatory power due to mutation of the gene controlling production of copulation tubes (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 1178). Experimental data obtained by the author have led him to ascribe such a phenomenon to the creation of cells of opposite mating type within the culture through mutation.

159 GARDÉ, A.
Nota cariológica sobre tres Orobancáceas portuguesas. (**Caryological note on three Portuguese members of the Orobanchaceae**).
Genet. Iber. 1951 : **3** : 133–42.

Meiotic studies showed that in *Orobanche crenata* $n = 19$, in *O. ramosa* $n = 12$ and in *Cistanche Phellipaea* $n = 20$. The presence of univalents and various other irregularities were noted in *O. crenata;* these included the appearance of three bivalents united to the nucleolus. This species is thus regarded as $6n + 2$ and the basic number for the family is thought to be not 19, as given by Darlington, but 12.

160 KNIGHT, C. A.
The nucleic acids of some strains of tobacco mosaic virus.
J. Biol. Chem. 1952 : **197** : 241–49.

Purine and pyrimidine analyses of mutant strains, previously shown to differ in respect of protein composition (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2140), indicate that the nucleic acid of all tobacco mosaic virus (TMV) strains remains essentially constant in composition through many mutations. Nucleic acid of cucumber viruses 3 and 4, both provisionally classified as mutant forms of TMV, was found to contain less adenine and more uracil than other mutants; consequently both strains have been excluded from the TMV group.

INSECTICIDES

161 FUJIWARA, I.
(Cytological studies on an interspecific hybrid of *Chrysanthemum cinerariaefolium*).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : p. 6. [Japanese]

Meiosis is described in the pollen mother cells of the F_1 hybrid of *Ch. cinerariaefolium* x *Ch. coccineum*. The hybrid is sterile and failure of pairing results in the formation of varying numbers of univalents.

CROP PLANTS

162 RATTRAY, A. G. H.
Agricultural Experiment Station, Salisbury. Annual report of Experiments, Season 1950–51.
Rhod. Agric. J. 1952 : **49** : 142–69.

Details are given of yield trials with maize inbreds and both single and double cross hybrids. Varietal trials of velvet bean and sunflower are also reported.

163 HÄNSL, H.
Bericht über das Institut für Pflanzenzüchtung der Universität in Cambridge (England). [**Report on the Plant Breeding Institute of the University of Cambridge (England)**].
Bodenkultur 1952 : **6** : 196–201.

A somewhat full account is given, for the benefit of German speaking readers, of the activities of the Cambridge Plant Breeding Institute and the National Institute of Agricultural Botany.

164 Institut pour l'Encouragement de la Recherche scientifique dans l'Industrie et l'Agriculture I.R.S.I.A. Rapport annuel. Exercice 1951. (**The Institute for the Promotion of Scientific Research in Industry and Agriculture, IRSIA. Annual report for the financial year 1951**) : Pp. 193.

The current report from the above Institute for the promotion of research in industry and agriculture in Belgium gives details of projects for the improvement of the following agricultural and horticultural crops by selection or breeding: cereals, beet, potatoes, hops, carrots, spinach, beans, peas, *Scorzonera* and grapes. The breeding of forest trees and the study of relevant genetic problems are also receiving financial support from the institute (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2280).

165 (**The winners of Stalin prizes for the year 1951**).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 5 : 3–6 [Russian].

Reference is made to some varieties of economic plants recently developed in the USSR.

Apple. Several new varieties, including the early Pervomaĭskoe [1 May], have been bred at the Ukrainian Scientific Institute of Horticulture.

Stone fruits. At the Nikita Botanical Garden, hardy apricots and plums remarkable for good quality of their fruits have been developed. Hardy cherries and peaches have been bred at the Ukrainian Scientific Research Institute of Horticulture. The peaches Kievskiĭ Ranniĭ [Early Kiev], Kievskiĭ Samyĭ Ranniĭ [Earliest Kiev] and Baĭrak are noted for the good flavour of their fruits.

Fig. New hardy varieties have been produced at the Nikita Botanical Garden.

Olive. Productive hardy varieties were developed at the above institute.

Strawberry. New varieties bred at the Ukrainian Scientific Research Institute of Horticulture include Kievskaja Rannjaja [Kiev Early] and Kievskaja Rannjaja 2, which are 10–12 days earlier than other Ukrainian varieties.

Vegetables. At the USSR Institute of Plant Industry and its Arctic Research Station several early and hardy varieties of root crops, cabbage and tomatoes have been developed.

166 Pesola, V. A.
30 vuotta kasvinjalostustoimintaa. (**Thirty years work in plant breeding**). Maatalous, Helsinki 1948 : No. 4/5 : 42–49.

A review is made of plant breeding work in Finland during the years 1918–1948 carried out at the various plant breeding stations of the country.

167 *Årsberättelse över Sveriges Utsädesförenings verksamhet år 1951. (**Annual report on the work of the Swedish Seed Association for the year 1951**). Sverig. Utsädesfören. Tidskr. 1952 : **62** : 220–96.

During 1951, 28 new varieties, strains and élites were released, including the following: a new élite (C) of the tetraploid Svalöfs Dubbelstålråg [Svalöf Double Steel rye]; 01582a, an oat variety from Sv 33/2067 x Seger [Victory], equalling Seger in the size and plumpness of the grain, but superior in stiffness of straw and yield; Å 01600, an oat selection from Sv 27/659 (sister variety of Orion III) x Orion II, exceeding Orion III and Same in yield as well as being early and stiff-strawed, with fine plump grain; the red clover Sv 02, a new Merkur élite, resistant to rot and eelworm; the tetraploid sugar mangel 0201; the tetraploid fodder beet 0301 of the Barres type; and the turnip M 025, which is a combination of tetraploid strains.

Winter wheat. A line derived from 01460 (Atle x Äring I) is specially mentioned as yielding 4000 kg. per ha. of grain, i.e. 45% more than the control Eroica II, in spite of a severe outbreak of rust.

Spring wheat. Breeding was continued on previous lines, special attention being paid to hybridization between autumn and spring varieties to increase the yield of the latter.

Spring varieties showed greater variation in rust resistance than winter wheats. Some partly resistant varieties that also yielded well were: Sv 48/657 (0978 x 01015), Pondus, Dalatant, 01170b$_2$ and 01172 (both from 01015 x Å 24/585), Ög 01140a and Certus (Fylgia x 0990).

Oats. The established breeding programme has been followed. In the early white oat group, 01439, now named Blixthavre [Lightning oat], from the cross Örn [Eagle] x Sølv II [Silver II], showed its superiority.

Rye. Work with the older material followed previous lines, but the method of progeny tests was adopted with the new lines.

---

* An extended summary of this paper is on file at the Bureau.

Research on tetraploid Stål [Steel] was continued.

Barley. Among the six-rowed barleys Presto (01771) did best with a yield of 4380 kg. per ha. as compared with 4110 for Brio and 4010 kg. per ha. for Asplund. The strongest straw in combination with high yield was recorded for a line b_4 from Presto.

Grain yields from the winter barleys were 4690 kg. per ha. from Bore and 4660 kg. per ha. from Fimbul, while a line from Bore, Vg 49/4, exceeded Bore by 9%, thus surpassing all the other varieties. A line selection from Kenia x Mansholt's had the strongest straw; it is one of several interesting combinations of spring and winter barleys.

Legumes. The commercial cooking pea Torsdags II [Thursday II] yielded 2780 kg. of seed per ha., while the yields from both Torsdags III and Kloster were 5% higher, and from a line of Torsdags II x Munk [Monk] 18% higher. The vetch Vg 02051, derived from a Remmendal vetch, did best with 2860 kg. per ha.

Promising results were obtained in yield trials of early mutants obtained by X irradiation of lupins.

The three clovers, Sv 045 (Merkur) and the tetraploids Sv 034 (Merkur x Wambåsa) and Sv 054 (from Merkur) surpassed Merkur by about 10% in yield.

Root crops. Trials of fodder beets, sugar mangels, turnips and carrots were carried out. Two strains of the leafy turnip underwent preliminary tests.

Potatoes. New breeding material was tested at Svalöf and Ugerup.

Collaboration with the National Plant Protection Institute was continued to obtain *Phytophthora* resistant varieties from material comprising *Solanum demissum.*

Tests were carried out on the effects of X rays and radioactive isotopes on potato tubers.

Flax. Very high yields were obtained from Cascade and the Dutch varieties Formosa and Wiera. The highly specialized fibre flax Sv 0222, a sister variety of Margareta, exceeded Herkules in yield of straw by 18%, but seed production was low. Some other new varieties surpassed the control in the output of straw and fibre and also showed improved strength of straw and resistance to *Melampsora Lini.*

Sv 01080 and Sv 01081, derived from a North American linseed, and Sv 01013 from Afghanistan surpassed the control, Svalöfs Renodlade [Svalöf Pure-bred].

Hemp. A new superélite of diecious hemp from Germany produced 9150 kg. per ha. of stems and 464 kg. per ha. of seed, while the total yield of fibre was 1545 kg. per ha.

Some monecious hemps are being retained for selection of parents with a high fibre content for future hybridization work.

Tobacco. Yield trials included lines from crosses between indigenous and American tobaccos. Selection was carried out in some new hybrids, including back crosses between the best new lines and the parent varieties.

Hops. New plants from natural hybrids were included in the breeding material. Hybrid clones at Näsum have proved particularly satisfactory as regards their content of resins and some of the best of them ripen at a suitable time and give a good yield of green matter as well as having easily plucked cones.

Oil crops. Breeding followed the same lines as in 1950. Results of trials of rape, *Camelina* and poppy are recorded.

Kok saghyz. The main criterion in selection was rubber content, but in some families attention was paid to root size, short thick roots being regarded as specially desirable. Several families contained up to 18–19% of rubber on a dry matter basis as compared with 6·5% in unimproved plants.

Soya bean. Breeding operations followed the same lines as in 1951. At Teckomatorpsgård, the control Soja Wilnensis ripened on 2 Oct. and gave a yield of 410 kg. per ha., and Ugra ripened on 28 Sept. and yielded 710 kg. per ha., while at Ugerup the corresponding yields were 793 and 1030 kg. per ha. respectively.

Cytogenetic research

Much of the work of the Chromosome Division was concerned with polyploidization and the testing of polyploid forms of rye, black medick, red clover, Alsike clover, timothy, sugar and fodder beets, and turnips.

H. Kuckuck continued his study of induced polyploid flax with special reference to selection for fertility. He also investigated the sex chromosomes in hemp. Other theoretical studies concerned the cytological investigation of (1) the position of the translocation locus in the idiogram of barley mutants (Hagberg and Tjio), and (2) trisomic ryes (Ellerström).

Work on the possible control of mutation is proceeding actively. It seems that there is a possibility of controlling strength of straw in barley by means of the so-called *erectoides* mutants.

A study of mutations of interest from a practical standpoint has shown that some mutants of barley, wheat, and oats were superior in yield to the parent forms. Yield trials of sweet lupin mutants for earliness have also been promising. Other crops, e.g. soya bean, mustard and some grasses, have now been included in this research programme.

The white mustard Primex, which exceeds its parent material in yield by 6% was isolated after X-irradiation; the increased yield of seed was accompanied by mutations in flower colour, shape of pod and chlorophyll formation.

Institute for Genetic Research

Work on rye-wheat continued, and included crosses between rye-wheat and rye, with colchicine treatment of the resulting hybrids in order to obtain rye-wheat types with 42 wheat and 28 rye chromosomes.

The tetraploid rye Dubbelstål, released in autumn 1951, was bred from tetraploid Stål. Tetraploid Kungsråg [King's rye], tested for the first time this year, was inferior to tetraploid Stål in yield. At Ugerup, the reduction in the set of seed in tetraploid rye exposed to ordinary rye pollen is being studied.

Barley with the double chromosome number has been obtained, but though improved types have resulted from hybridization and selection, none are of practical value.

A synthetic rape from crosses of tetraploids of turnip rape and cabbage has remarkable vigour and fertility, and crosses readily with common rape.

Detailed reports from the various branches and substations are appended.

168 Nieuwe rassen, welke in 1952 worden beproefd voor plaatsing op de rassenlijst. (**New varieties which will be tested in 1952 for inclusion in the variety list**). Euphytica, Wageningen 1952 : **1** : 142–48.

Varieties of the following crop plants undergoing provincial field trials are listed: wheat, barley, oats, rye, grasses, serradella, maize, lucerne, clover, vetches, lupins, beets, turnips, potatoes, flax, poppy, rape, linseed, carrots, kale, peas and beans.

169 Verslag over de Landbouw in Nederland over 1949. (**Report on Agriculture in the Netherlands during 1949**). Versl. Dir. Landb., 's Grav. 1951 : Pp. 504.

This report contains a section dealing with the organization and work of various research institutions, including those mentioned below:—

Institute for the Breeding of Agricultural Crop Plants, Wageningen

Research was carried out on basic problems related to plant breeding, e.g. disease resistance, inbreeding and heterosis, specific and generic hybridization, cytology, artificially induced mutation and physiological differences in races. Observations in progress on pollination, fertilization and heterosis in inbred strains of rye show that some inbreds have a marked tendency to cross-pollinate, while in others selfing predominates, and, finally, neutral strains exist in which both forms of pollination occur. Some attractive types with well filled ears and abundant tillering have been noted among (1) wheat forms that have segregated from wheat-rye hybrids, and (2) back crosses of these segregates with certain wheat varieties. Numerous interspecific crosses of *Triticum* were made.

In the course of a study of the possibility of remedying the reduced fertility of tetraploids by breeding, an extensive search for plants with aberrant chromosome numbers was begun. The study of the rye strains suggests that the percentage of aneuploids can be reduced and the fertility increased by breeding.

Tetraploid forms of barley, flax, canary seed and buckwheat are now available as breeding material.

Relatively few rye tetraploids were obtained by the usual method of colchicine treatment, but favourable results have been achieved by leaving newly germinated seed in a colchicine solution for two hours at 27°C. Dry matter composition in different varieties of fodder beets was investigated.

Research on blight resistance has advanced and resistant parents are to be selected from the seedlings of the first and second back cross from hybrids of cultivated varieties with *Solanum demissum*. *S. longipedicellatum* and *S. lanciforme* are not attacked by any physiological race of the blight fungus. To counter the possibility that new races may arise that can attack hybrids, so far resistant, breeders are trying to ensure that parent plants are drawn from as diverse material as possible to increase the chance of combining resistance factors. Resistance to other diseases and to Colorado beetle is also being sought. Other research included (1) the grafting of potato varieties on tomato varieties to induce flowering and (2) a study of the origin of bud mutants in potatoes.

Experiments on disease resistance and hybridization of flax were carried out.

National Institute for Research on Varieties of Crop Plants, Wageningen

In connexion with the official registration of varieties and strains, which involves comparative morphological and phenological studies, a report on French beans, as a field crop, was made with a view to the approval of varieties by the Council for Breeders' Rights [Raad voor het Kwekersrecht].

Identification of varieties of potatoes by germination under illumination was undertaken by the Plant Disease Control Service.

Netherlands Flax Institute, Wageningen

Comparative variety trials of flax and of linseed were carried out.

Institute for Horticultural Crop Breeding, Wageningen

Research on vegetables and fruits was concerned with seed quality, the production of improved varieties and strains, and the breeding and testing of new varieties. Vegetable selections were tested by the Danish system.

Institute for Efficient Sugar Production, Bergen-op-Zoom

The study of beet varieties was continued, one variety being put on the recommended list. A variety adapted to northern Holland is still needed. Strain differences in tolerance of the yellows virus were investigated by the serological test.

Institute for Research on Plant Diseases, Wageningen

Numerous tobacco crosses have been tested for susceptibility to mosaic and suitable types for growing have been selected from the resistant varieties.

170 VEENSTRA, G.
Afgifte kweekmateriaal S.v.P. (**Breeding material released by the Foundation for Plant Breeding**).
Euphytica, Wageningen 1952 : **1** : 140–41.

The Foundation for Plant Breeding provides information and assistance to breeders of field crops in the Netherlands. Plant material is released for the use of breeders either gratis or for a nominal fee.

In 1951 seed of the following material was available: hybrid populations of cereals and of flax selected for rust resistance; crosses of young potato clones; and second-year lines of oats, barley and tetraploid sugar beets.

The foundation possesses an extensive collection of parent material of potatoes including many hybrids from crosses with *Solanum demissum* and other wild varieties. Many of these parents were chosen for their resistance to *Phytophthora* and a large number are derived from Bintje.

171 **Annual Report of the National Institute of Genetics, Japan, 1949-1950**
(1951) : No. 1 : Pp. 53.

Matsumura, S. Radiation genetics conducted on cereals. (pp. 22–23).

In experiments on the induction of chromosomal aberrations in *Triticum monococcum* by irradiating the seeds, a study was made of the cytology of the induced reciprocal translocations and of the relationship of the frequency of chromosome aberrations to dosage and wave length (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts 262, 264 and 2580). Experiments have also been carried out using fast neutrons and α rays. Mutants of *Hordeum distichum* obtained by X ray treatment of the seeds are briefly described (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 386).

Matsumura, S. Nullisomics deficient in a chromosome pair of the D-genome found in pentaploid wheat hybrids. (pp. 24–25).

Dwarf nullisomics with $2n = 40$ chromosomes occasionally appear among the progeny of *Triticum polonicum* x *T. Spelta;* these nullisomics are each deficient in a chromosome pair belonging to the D genome. Nullisomics for each of these chromosome pairs have been discovered and have been designated a, b, c, d, e, f and g dwarfs according to the pair missing. Gigas plants with high fertility have occurred in progenies obtained by selfing each type of nullisomic; such plants appeared most frequently in the b dwarfs. Hybrids of the a–g gigas strains with *T. polonicum* usually showed a chromosome configuration of $1_{III} + 13_{II} + 6_{I}$, compared with $14_{II} + 7_{I}$ in the F_1 of *T. Spelta* x *T. polonicum*. In hybrids with *T. Spelta* the configurations $1_{III} + 19_{II} + 1_{I}$ and $20_{II} + 2_{I}$ occurred most frequently; in the b and f gigas forms 21_{II} and $1_{IV} + 19_{II}$ were also of frequent occurrence. In each case therefore the excess chromosome pair must have been derived from the A or B genome. The supernumerary chromosomes are tentatively designated α, β, γ, δ, ϵ, ζ and η according to whether they have originated in a, b, c, d, e, f or g gigas plants. Each of the chromosomes α to η is semihomologous with the corresponding chromosome of the a to g series.

Matsumura, S. Genome-analysis in Agropyrum, *a genus related to* Triticum. (*p. 25*).

Data on chromosome association obtained from *T. turgidum* x *A. glaucum*, *T. Spelta* x *A. glaucum* and *T. Timopheevi* x *A. glaucum* have led to the conclusion that *A. glaucum* carries a genome homologous with the B genome of *Triticum* (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2230 and Vol. XXII, Abst. 1761).

Matsumura, S. Other studies on wheats. (*pp. 25–27*).

A brief account is given of the results of an investigation of fertility and genome homologies in hybrids of AABB wheat species and *T. Timopheevi* (AAGG) with *T. aegilopoides* and *T. monococcum* (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 261).

Data from the F_2 of a cross between *T. dicoccoides* x *T. persicum* indicate that each of the following pairs of characters depends upon a single pair of genes: long *vs.* short glume (*Pp*), presence of awns (*Aa*), hairy *vs.* glabrous glume (*Hghg*) and red *vs.* green coleoptile (*Rcrc*). The difference between waxy and waxless depends upon the gene pair *Ww* and a pair of inhibiting genes, *Iwiw*, the genotype of waxless *T. dicoccoides* being *wwIwIw*. *W* and *Iw* are inherited independently of *P*, *A*, and *Hg*. The factor pairs *Pp* and *Rcrc* are linked with a cross-over value of 20·3%. When homozygous in *T. polonicum*, the gene *P* for long glume inhibits awn length, glume hairiness and colour of the coleoptile and awn. A failure to segregate observed in crosses between tetraploid wheats is believed to be due to the inhibitory effect of *P*. Abnormality in glume length also occurred in these crosses and is tentatively attributed to the effect of modifying genes upon *P*.

Endo, T. Cytogenetic studies on wheat-rye hybrids. (*pp. 27–28*).

The author has observed cytological irregularities in Rimpau's *Triticale*, similar to those reported by previous investigators. The possibilities that considerable segmental interchange has occurred between and within the genomes in Rimpau's and other old *Triticale* strains and that the wheat plasm has influenced the rye genome are now being investigated.

Kimura, M. Determination of right- and left-handedness in the spikelet of Triticum monococcum vulgare. (*pp. 28–29*).

The distribution of left and right handed spikelets in Einkorn wheat has been investigated by means of probit analysis. The tendency towards bipolar polarization in respect of left or right handedness decreases as one proceeds towards the apex of the ear. X irradiation of the young ear decreased the relative values of the potency determining left or right handedness. In the F_1 of Einkorn x Emmer, the former species having a high potency and the latter a low potency in respect of the character concerned, the relative value of the potency was approximately equal to the parental mean.

Takenaka, Y. Sterility of triploid plants. (*pp. 29–30*).

Four types of sterility are recognized among triploids, viz. the *Hemerocallis*, *Lycoris*, *Lilium* and *Crocus vernus* types. The possible causes of each type are discussed.

Takenaka, Y. Sterility and autotoxicosis of Colchicum autumnale. (*pp. 30–31*).

In central and southern Japan *C. autumnale* is usually sterile. Meiotic irregularities similar to those induced by colchicine have been observed at ordinary temperatures. Low temperature appears to weaken this autotoxic effect; under the influence of high temperature, deleterious toxic effects as well as cytological irregularities occurred. The sterility of *C. autumnale* is therefore regarded as the result of the relatively high atmospheric temperatures in the central and southern regions.

Takenaka, Y. Studies on sex-differentiation in higher plants. (*pp. 32–33*).

The progeny of a cross between a colchicine-induced tetraploid of *Cannabis sativa* as female and a normal diploid comprised 7 females, 5 intersexes and 2 males; the chromosome constitutions were 3A + 3X in the females, and 3A + 2X + Y, or derivatives of this constitution, in the intersexes and males. The author agrees with the views of previous investigators that the Y chromosome is larger than X and that Y influences the appearance of male characters.

The progeny of a cross between a colchicine-induced tetraploid of *Humulus japonicus* as female and a normal diploid consists of 18 females (3A + 3X) and 7 intersexes (3A + 2X + Y_1 + Y_2). This observation is in accordance with Ono's hypothesis that sexuality of this species is determined mainly by the ratio between the X chromosomes and autosomes (cf. *Plant Breeding Abstracts*, Vol. XII, Abst. 547).

Miyazawa, A. Sterility of Phaseolus multiflorus *under high temperature.* (*p. 33*).

Phaseolus multiflorus gives much higher yields in the cool regions of Japan than in the milder areas. Pollen grain analyses were carried out during the period 2 September to 11 October. The percentage of empty grains was 2% on 2 September. As the season advanced the percentage of empty grains gradually fell; the range in size also decreased. The highest percentage of empty grains, it is assumed, occurred in pollen which had been in the maturation stage when the temperature was as high as 31° C.

Sakai, K. Genetic studies on Solanum melongena *and* Capsicum annuum. *(p. 34).*

Heterosis and genes for quantitative characters are being studied in *S. Melongena* and *C. annuum.*

Takenaka, Y. Cytogenetic studies on the genus Nicotiana. *(p. 35).*

Meiosis was regular in *N. plumbaginifolia* ($2n = 10$), *N. repanda* ($n = 24$), *N. glauca* ($n = 12$) and *N. sylvestris* ($n = 12$). *N. glutinosa* ($2n = 24$) gave some evidence of secondary association. Two colchicine-induced tetraploids of *N. Tabacum,* obtained in 1944, have reverted completely or partially to diploidy. The colchicine-induced amphidiploid of *N. plumbaginifolia* x *N. alata* showed 19 bivalents in the first meiotic division and some irregular distributions at anaphase II.

Gotoh, K. Some effects of sodium ribose nucleate on somatic mitosis of some plants. (pp. 35–36).

In root tips of *Tradescantia paludosa* treated with 1% sodium ribose nucleate for 12–24 hours, a few cells contained chromosome groupings of the reductional type.

Matsumura, S. Improvement of sugar beet by means of induced triploidy. (p. 39).

In trials carried out in Hokkaido during recent years triploid sugar beets have outyielded diploids and tetraploids. It is expected that intervarietal hybridization between tetraploids showing maximum yielding capacity and disease resistant diploids will result in even better yields. The inferior germination of $3n$ seeds is however a problem. For large scale production of $3n$ seed, $2n$ and $4n$ beets can be planted in alternate rows. By natural pollination, about 30% of the progeny of seeds from $2n$ mother plants have proved to be triploid; the $4n$ mother plants have given over 70% $3n$ progeny. The frequency of $3n$ offspring is however influenced by factors such as ratio of $2n$ and $4n$ plants and parental differences in flowering time and growth rate of pollen tubes.

Furusato, K. Genetics and breeding of citrus plants. (p. 40).

Cytological investigations of *Citrus* spp. are in progress to elucidate interspecific relationships. Most species are diploid ($2n = 18$), but some are tetraploid ($2n = 36$) and others triploid ($2n = 27$). A study of polyembryony is under way. Most albino seedlings are of nucellar origin; cytological and other studies are being carried out to explain the development of such seedlings.

Furusato, K. Induced polyploidy in useful plants. (pp. 40–41).

Tetraploids of several economic plants have been induced by colchicine.

When pollinated by a mixture of n and $2n$ grains, the tetraploid form of water melon produces about 90% and 10% of triploids and tetraploids respectively; probably certation occurs between the haploid and diploid grains. An attempt is being made to obtain triploid water melons from intervarietal crosses between $2n$ and $4n$ plants. Grafts of young shoots from $2n$, $3n$ and $4n$ plants on calabash stocks give very high yields; grafting of $4n$ shoots on calabash should prove useful in the production of triploid seed for commercial purposes.

Attempts are being made to obtain seedless triploids of tree fruits.

Other crops of which tetraploids have been produced include forage and green manure legumes, fodder radish, and vegetables, e.g. carrot, edible burdock, *Luffa* and calabash.

Komai, T. Semiallelic genes. (p. 41).

The characteristics and occurrence of semi-allelic genes are briefly considered (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 32).

Sakai, K. On variance due to competition between plants of different types in plant populations. (pp. 41–43).

The variance due to differential competitive effects in field trials of segregating hybrid populations is analysed. The importance of this component of environmental variance had been noted in trials of mixed sowings of two rice varieties.

Sakai, K. Theoretical studies on individal selection in plant-breeding with special reference to gene recombination. (pp. 43–45).

Expressions are derived for ascertaining the optimum generation, population size and number of individuals to be selected for a segregating hybrid progeny undergoing selection for desirable dominant genes in the homozygous condition.

Kimura, M. Effect of random fluctuation of selective value on the distribution of gene frequencies in natural populations. (pp. 45–47).

In an analysis of the significance of the Wright effect, the author concludes that, although the effect produced by random fluctuation in natural selection on small populations is slight, it may be highly significant in large populations (*a*) when the frequency of the alleles is low and dominance is lacking, or (*b*) when the recessive gene lies within a certain range of high frequency values and dominance is complete.

Kimura, M. Physiological theory of polygenic actions. (pp. 47–48).

A model is constructed for polygenic systems, assuming that these systems control a chain of monomolecular reactions, each stage being regulated by one gene or its allelomorph, the difference in activity between the allelomorphs being postulated as slight. From this model it is possible to derive expressions relating to arithmetic and geometric gene interactions, and to dominance.

Kimura, M. Recombinations of chromosome segments through continued self-fertilization. (pp. 48–49).

Expressions are derived for the frequency of heterozygous chromosome pairs after n generations and for the frequency of the parental and recombination homozygotes.

Kimura, M. Studies on the process of chromosome substitution. (pp. 49–50).

Calculations are made of the number of generations required to transfer a chromosome complement to a foreign cytoplasm. The relevant expressions become much more complicated should fertility decrease through the inhibitory action of the cytoplasm on specific genes.

Kimura, M. Theoretical relations among map-distance, recombination value and coincidence ratio. (pp. 50–51).

General expressions are derived connecting map distance, recombination value and coincidence ratio.

172 Annual Report of the Bose Research Institute for the year 1949-1950: Pp. 39.

Cotton. The progress of the scheme financed by the government of West Bengal for evolving disease resistant long-stapled cottons adapted to deltaic regions is outlined, with details of lint length, ginning percentage and time of flowering of 25 promising F_4, F_5, F_6 and F_7 selections. Healthy plants bearing numerous bolls were grown from X-irradiated seed of 12 pure lines and three F_7 hybrids. Three mutants with fuzzless seed appeared among progenies of CO 2 x 4F, 920 x 4F and 920 x LSS; inheritance of quantity of fuzz is to be determined.

Jute. Data are presented showing that X-irradiated seed of varieties D 154 and D 386 of *Corchorus capsularis* and varieties CG and R 26 of *C. olitorius* produces plants with greater height and basal diameter than those grown from untreated seed. Pollen sterility was increased by irradiation, the maximum increase being from 2·75 to 16·58% in R 26.

Several early maturing variants of R 26, obtained after X irradiation in previous seasons, have transmitted this character; one selection flowered in 62 days, whereas R 26 flowers after 106 days.

Cytological studies of flower buds of plants showing morphological abnormalities after irradiation are reported. Meiotic abnormalities include cytomixis, lagging, restitution nuclei, and bridges giving rise to unequal numbers of chromosomes at opposite poles and, subsequently, gametes with irregular chromosome complements.

Results of saline irrigation experiments indicate that many *C. capsularis* strains are more tolerant of salinity than *C. olitorius*. Survivors have been selected for further trial.

Oil seeds. X rays are being used in an attempt to induce favourable mutations in strains of *Sesamum* and *Brassica* from all parts of India.

173 Annual Report of the Bose Research Institute for the year 1950-1951: Pp. 48.

In addition to research summarized below, the effect of ultrasonic radiation on root tips of *Hordeum vulgare, Allium Cepa, Vicia Faba* and *Cicer arietinum* has been investigated; no significant differences were observed between genera. Except for absence of chromosome breakage, observations were similar to those of Newcomer and Wallace (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 2026 and Vol. XIX, Abst. 1597).

Potato. Under greenhouse conditions White Burley tobacco and *Datura* were used as indicators for identifying and separating virus isolates from potatoes. The variety White Round proved more resistant to leaf roll than Red Round. Virus infections were also studied in field plots of different varieties at Darjeeling.

Cotton. The breeding programme reported in Abst. 172 has been continued to the F_8. Field trials of selections to determine their adaptability, date of flowering, number of bolls per plant, lint length, ginning percentage and resistance to pests and diseases are reported. Sea Island compared favourably with local varieties, giving a lint length of 50·5 mm., but its ginning percentage was rather low. This variety appears to thrive in the shade of trees and may therefore prove suitable as a subsidiary crop in coconut and other plantations. Parbhani American cotton proved inferior to local types in respect of lint length and date of maturity.

Progenies of promising X-ray-induced mutants are undergoing observation.

Jute. X irradiation experiments were continued. In comparison with nonirradiated strains of *C. capsularis* and *C. olitorius*, progenies of a tall mutant attained a greater height, showed a 53·8% increase in weight of fibre and flowered earlier. Several selections were made for further trial. Seeds of the tall mutant were also exposed to X irradiation.

Sesamum. Numerous plants grown from X-irradiated seed matured earlier than untreated parent strains, the maximum increase in earliness being eight days. High yielding, early maturing selections are to undergo trial without further irradiation. Cytological studies revealed few meiotic irregularities subsequent to X irradiation; the chromosome number ($2n = 26$) was the same in all strains, before and after treatment.

174 CHAVANCY, A.
Compte-rendu des travaux du Centre d'Expérimentation Agronomique de Blao en 1947–1948 et 1949. (**Report on the activities of the Blao Agricultural Research Centre in 1947-48 and 1949**).
Arch. Rech. Agron. Cambodge Laos Viêtnam 1951 : No. 10 : Pp. 75.

Work has begun again at the Blao Station with the building up of collections of selected material of cultivated plants, including tea, coffee, tung, rice, pepper and ramie.

175 **Annual report of the vegetable growers association of America, 1951** : Pp. 192.

The following papers were among those presented at the 43rd Annual Convention held at Atlantic City in December 1951.

Stevenson, F. J. Potato breeding in the United states. (pp. 41–42).

A brief survey is given of the improvements in adaptability, agronomic characteristics, quality and disease resistance achieved in the past 100 years by research and by hybridization, involving both cultivated varieties and wild species.

Munger, H. M. Onion hybrids and varieties. (pp. 49–54).

Breeding techniques used to transfer the male sterility of Indian Red 13–53 to other inbreds selected as desirable parents for the production of hybrid seed are outlined. Some indication is given of the number of hybrids now available for particular localities in the USA (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 785); many of these have consistently outyielded locally grown varieties, but adaptability trials are still incomplete.

176 TRULLINGER, R. W.
Report on the agricultural experiment stations, 1951.
U.S. Dep. Agric. 1952 : Pp. 170.

This general review of research includes crop breeding in progress at agricultural experiment stations in cooperation with the US Department of Agriculture, and full descriptions of newly released varieties.

177 **Agricultural research in Maine. Sixty-sixth Annual Report of progress year ending June 30, 1950.**
Bull. Me Agric. Exp. Sta. 1950 : No. 483 : Pp. 76.

Maize. Trials of flint, flint-dent and dent hybrids were carried out. Several new flint hybrids showed promise for short season conditions. One flint-dent double cross was superior to Maine B in earliness, yield and vigour. The new threeway cross W 85 x W 15 x SD 105 gave outstandingly good results.

Potato. Further selection of leaf roll resistant seedlings gave promising results. In tests of resistance to green peach aphids, winged aphids failed to develop in large numbers upon a few seedlings. Some seedling varieties derived from crosses with *Solanum demissum* showed resistance to bacterial ring rot and late blight. Several promising seedlings selected from crosses between ring rot resistant parents possessed desirable commercial properties and a high degree of resistance to this disease.

Apple. Progress is reported in breeding for improved quality in varieties for winter consumption.

Strawberry. Three selections from Aberdeen x Howard 17 showed promise with regard to red core resistance, hardiness, productivity and fruit characters. They were superior to Howard 17, Temple and Sparkle in yield.

Tomato. Artificial inoculation and field tests were carried out on cultivated varieties and wild species for resistance to late blight. In the former tests four wild species were slightly resistant, and two resistant and three tolerant commercial varieties were discovered; the F_1 progeny of two resistant parents was highly resistant. In the field trials, four varieties showed both foliage and fruit resistance.

Beans. A selection of the bush type has been named Highmoor Yellow Eye. It has good quality for baking, equals the semirunner variety Old Fashioned Yellow Eye in yield and matures a few days earlier.

Sweet corn. Development of hybrids suitable for canning is in progress.

178 **Annual Report of the Massachusetts Agricultural Experiment Station for the fiscal year ending June 30, 1951.** Bull. No. 466 : Pp. 62.

Apple. All the fruits of the Rogers sport of McIntosh have so far been completely red. Further tests of this and other bud sports of McIntosh are to be carried out.

Broccoli. Waltham 11 and Waltham 29 have given good results in large scale trials by market gardeners. Waltham 11 can be grown in spring and autumn; in spring trials it has produced a larger marketable crop than any other variety. Its heads are medium large and dark green, with small buds that remain tight for several days. Waltham 29 is suitable only as an autumn crop. It is a more uniform type than Waltham 11 and other broccolis. It produces very large heads with many heavy stems under the buds; it is especially suitable for freezing. It has outyielded other varieties by 10 to 20%.

Tomato. Two hybrid selections whose immunity to *Cladosporium* leaf mould has been derived from *Lycopersicon peruvianum* have been crossed with Improved Bay State to combine desirable commercial type with this immunity. The hybrid Pennheart x Red Cloud has been released to farmers for field trials.

Sweet corn. The recently introduced hybrid Gold Mine has matured earlier than other commercial hybrids with which it has been compared in tests for six years. The new hybrid Barbecue, possessing an exceptionally long and attractive ear with good quality, has been released for farmers' trials. The chief aim of breeding is now the introduction of higher quality into early hybrids by using a glumeless form and also a supersugary type.

A method of estimating degree of maturity has been devised which is based on the light-scattering effect of the components of the kernel when blended and suspended in water.

179 **Sixty-fourth Annual Report of the New York State College of Agriculture at Cornell University and the Cornell University Agricultural Experiment Station, 1951** : Pp. 119.

Breeding programmes with various crops, and associated cytogenetical investigations, are included among the lists of research projects under way at the station.

180 **50 years of plant science.** US. Dep. Agric., Agric. Res. Admin., Bur. Pl. Indust., Soils Agric. Engin., Div. Inform., Beltsville, Md. 1951 : Pp. 16.

Research, including numerous genetical investigations and programmes of hybridization, carried out at the Plant Industry Station, Beltsville, Md., during the past 50 years, is briefly summarized.

181 **Serving Georgia through research. 1951 Annual Report of the University of Georgia College of Agriculture Experiment Stations** : Pp. 76.

Maize. The new hybrid GAC–0211 has given yields equal to those of the yellow and white hybrids grown in the Piedmont area; it is not yet in commercial production.

Field pea. The winter pea Romack, developed from a cross between Austrian Winter and a vigorous type from Puerto Rico, was released (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1554).

Cotton. Selection of hybrids between Sea Island and Egyptian cotton continued.

Sweet pepper. Introduced peppers resistant to bacterial spot are being crossed with Truhart Perfection, to improve the disease resistance of the latter. Selections from Truhart Perfection x Santanka show promise.

Groundnut. A selection of Spanish 146 has been released under the name Dixie Spanish. It equals the parent strain in yield but is more uniform in seed size.

Blueberry. The new varieties Callaway and Coastal were released (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1900).

Cantaloupe. Selection of Georgia 47, a strain resistant to mildew and lice, has been undertaken to improve its fruit size and shape.

182 **Research in agriculture. Annual Report of the Agricultural Experiment Station, Louisiana State University and Agricultural and Mechanical College, Baton Rouge, Louisiana 1950-51** : Pp. 224.

Oats. Varieties well adapted to the northeastern and northwestern districts are listed.

Maize. Yellow and white hybrids are recommended for different parts of the state on the basis of trials at 11 centres. Dixie 18 is widely adapted as a silage variety.

Rice. At the Rice Experiment Station, Crowley, several unreleased numbered selections of midseason and late maturity have outyielded commercial standards. A technique is described for determining the reaction of breeding material to white tip disease caused by nematodes.

Forage grasses. *Bromus catharticus* has given higher yields than either *B. inermis* or *B. marginatus* in local trials of strains suitable for winter grazing.

Selections made from B 230, a new strain of Dallis grass, have given progenies with a higher percentage seed set than the original strain; as variation in fertility appears to be inherited, further improvements are possible by hybridization and selection.

Forage legumes. Relative winter hardiness of strains of *Trifolium pratense*, *T. repens*, *T. subterraneum* and *T. incarnatum* was determined; locally developed strains of *T. pratense* and *T. repens* were superior to introduced varieties.

Vicia villosa proved more resistant to low temperatures than other species of vetch on trial at Baton Rouge, and is recommended for ploughing in on land where other vetches have failed after being grown for successive seasons.

Potato. Seedling selections have been made in the greenhouse on the basis of colour and shape of tubers; they have been sent to Clark, S. Dak., and Crossville, Tenn., for disease resistance trials.

Sweet potato. In conditions unfavourable for seed production, seedlings 8–31, 130 and 201 produced the highest percentage seed set when used as male or female parents. Numerous first year seedlings were selected for potential yielding ability. Seedling L–241 was released under the name Goldrush (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1976 and Vol. XXII, Abst. 528). The new variety contains approximately twice as much carotene as any other variety grown at 11 trial centres and is resistant to *Fusarium* wilt. Results of field and greenhouse tests with numerous seedling progenies have shown that resistance to *Fusarium* wilt is determined by multiple factors. Many commercial varieties, including Goldrush and Unit 1 Porto Rico, proved susceptible to soil rot when grown on infected plots; seedlings L–224 and 9–33 were, however, resistant.

Cotton. Genetic investigations of yield components have shown that (*a*) number of bolls per acre, (*b*) number of seeds per boll, (*c*) seed size and (*d*) weight of lint per unit of surface area per seed are inherited independently. Many important varieties have high degrees of only one or two of these yield components, indicating that even higher yields would be produced by combining several components in a single variety.

Reports of yield trials at different stations are presented. At Baton Rouge, Calhoun and Curtis, root knot nematode damage was most severe on Deltapine 15, while Delfos 9169 showed some degree of resistance. Selections from the cross Stoneville 20 x Deltapine 14–312 have proved resistant to bacterial blight and have produced good yields where the disease is prevalent.

Results of investigations conducted by the US Department of Agriculture have shown that several Louisiana hybrids possess resistance to *Fusarium oxysporum* f. *vasinfectum* and *Verticillium alboatrum*.

Sugar cane. Under greenhouse conditions many of the varieties which do not normally flower have produced viable pollen and seed; local hybridization may therefore be possible in the future, in which case breeding material will no longer have to be sent to Florida for seed production.

Reports of yield trials with commercial varieties and new selections are included.

Peach. Varieties suitable for northern districts are listed.

Strawberry. A large number of seedling progenies are on trial for resistance to leaf spot and scorch. In analyses of total and soluble solids, ascorbic acid and reducing sugars, seedling L–7–42 proved superior to all other selections and commercial varieties; it is particularly well adapted to northern districts.

Water melon. Crosses were effected between parents possessing a high degree of wilt resistance and other desirable characters. Seedling QX 124, which proved very resistant to wilt on infected plots, was released after being named Calhoun Sweet (cf. Abst. 734).

Allium. Lines of Red Creole onion which are true-breeding for red colour have been isolated by using a genetic marker. Superior lines are to be massed in pollination cages in order to produce a synthetic improved variety. The compatibility relationships between certain male sterile lines and C5 Red Creole are being determined. Numerous introductions are undergoing adaptability trials, with special reference to disease resistance. Some 33 mildew resistant selections from the shallot breeding lines (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 199) have also shown resistance to yellow dwarf virus and pink root; many were, however, more like *A. fistulosum* than their shallot parent and bulb formation was consequently poor.

Brassica. Many crosses have been made to secure a medium-sized, round-headed cabbage of good quality; several lines are being increased for further selection. Results of trials with early and late maturing varieties of cauliflower and broccoli are reported.

Tomato. Hybridization was effected between commercial varieties and a strain with resistance to fruit cracking but otherwise of undesirable quality; several types with improved resistance to cracking have been selected for further trial.

Egg plant. Progenies of New Orleans Market x Fort Myers Market and New Orleans Market x Black Beauty have outyielded all standard varieties in the Diamond district; the hybrids are of good shape and colour.

Okra. Crosses and selections have been made to improve the percentage oil content of locally adapted varieties; significant increase is reported.

Beans. Several unnamed dwarf bean selections have shown promise in trials with commercial varieties; Contender matured for the fresh market before any other variety. The release of Wade Bush (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2069 and Vol. XXII, Abst. 2332) is reported.

A locally developed Lima bean seedling, L–49, outyielded the standard Carolina Sieva in trials of new selections; L–1–1 matured later than Sieva but yielded more uniformly than the latter over its harvesting period and gave a higher ratio of shelled beans with respect to total pod weight.

Soya bean. Results of trials in cooperation with the US Regional Soybean Laboratory show that several new strains are well adapted to the northeastern district and give high oil yields.

183 **New findings for farm folk. Part I. A report of the Iowa Agricultural Experiment Station for the two years July 1, 1949 to June 30, 1951** : Pp. 73.

Wheat. Iohardi, released in 1949 (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 923), combines the winter hardiness of Minhardi with the high quality, stiff straw and stem rust resistance of Iobred.

Oats. Shelby was released (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 20). Varieties resistant to the races of rust to which Clinton is susceptible are being developed; a back cross of the hybrid between Clinton and Santa Fe shows particular promise.

Maize. Hybrid breeding continued.

Selection for higher content of tryptophane and lysine is giving encouraging results.

Recurrent selection has been found to be two to four times more effective than the ordinary method of inbreeding.

Breeding for resistance to stalk rot, *Helminthosporium* leaf blight and borer is receiving attention.

After silking, maize takes, in both early and late varieties, about 50 days to mature, i.e. to reach the maximum dry weight of the kernels.

Barley. Resistance to loose smut and scab is receiving considerable attention.

Forage grasses and legumes. Ioreed canarygrass was released in 1950 (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 35). The red clover Emerson is being selected for resistance to *Fusarium* wilt. Sweet clover breeding aims at developing new strains with superior characteristics for green manure and pastures; it includes interspecific hybridization. Lucerne breeding is being carried out to produce varieties with high yields of forage and seed, as well as resistance to diseases and insects. Transference of the hairiness of Arabian lucerne to commercial varieties is being attempted, to render the latter resistant to leafhopper.

Potato. Testing for late blight reaction in seedlings is proving to be a very satisfactory method of preliminary elimination of susceptible plants. Cherokee, resistant to scab and late blight, is recommended for extensive trial by growers on muck soils (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2775).

Onion. F_1 hybrids outyielded the commonly grown variety of storage onions by as much as 400 bushels per acre in trials during 1950; the highest yielding hybrid produced 1379 bushels per acre. The greatest advantage of the hybrids is not however their high productivity but their uniformity.

Tomato. The F_1 hybrids Earliana x Jubilee, Rutgers x John Baer and Indiana Baltimore x Pritchard are recommended for early, mid-season and main crop production, respectively.
Soya bean. The new varieties Adams (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1424) and Blackhawk (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2258), suitable for southern and northern Iowa, respectively, were released.
Pea. PI 185183 from Peru has shown mildew resistance and outstandingly high yielding capacity in the north central states. This introduction will probably be in commercial production in a few years.
Sweet corn. Iochief, suitable for canning or freezing, was released in 1951 (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1943). Progress is being made in breeding for borer resistance.
Popcorn. The yellow hybrid Iopop 6 and white hybrid Iopop 7 were distributed in 1950. They both have considerably greater popping expansion than the old open-pollinated varieties; other advantages are increased yield, stronger stalks, and resistance to disease and borer.

184 **Fourteenth Progress Report of the Alaska Agricultural Experiment Station 1949** (1951) : Pp. 31.

In addition to research reported below, trials have been in progress with varieties of tree fruits, soft fruits and vegetables introduced from Canada and the US.
Cereals. At Matanuska numerous newly introduced strains are being tested for adaptability. Promising selections were made from the following wheat crosses: Wisconsin Wonder x Reward; Pika x Khogot; Diamond x Khogot; and [(Red Bobs x Romanov) x (Garnet x Romanov)] x Khogot. Both Golden Rain oats and Edda barley were outstanding (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2717).
Forage grasses. Selections made from brome grass populations combine winter hardiness, leafiness and good yielding ability with disease resistance.
Forage legumes. Strains of *Medicago sativa* introduced from Canada and the USA are on trial to determine their ability to survive Alaskan winters. A few of the winter hardy strains of *M. falcata* showing promise of other desirable qualities have been selected. A number of interspecific crosses were made to combine winter hardiness with erect growth habit, high yielding capacity with respect to forage and seed, and resistance to seed shattering.
In adaptability trials of perennial legumes alsike clover outyielded all other species; high yields were also given by sweet clover, particularly the variety Hubam.
Potato. Approximately 800 seedling selections possessing one or more desirable characteristics were made from progenies of 49 crosses undertaken at the Matanuska farm.
Yields of recently introduced commercial varieties are being compared at Matanuska and Fairbanks.

185 Boerger, A.
"La Estanzuela," instituto fitotécnico y semillero nacional de la R.O. del Uruguay. **(La Estanzuela, the plant breeding institute and national seed station of Uruguay).**
Phyton, Buenos Aires 1952 : **2** : 50–54.

A review is given of past and present plant breeding work at the above station.

186 **Notes on current investigations, October to December, 1951.**
Malay. Agric. J. 1952 : **35** : 36–52.

Rice. Seed has been obtained from F_1 crosses.
Tea. Preliminary field selection of bushes has been completed; the next stage of selection is to be based on rooting trials.
Cacao. Multiplication of the Amelonado type is in progress. General observations are being maintained on imported Trinitario progenies and legitimate progenies from local trees of this type. The Criollo cacao is showing less vigour than Trinitario in a comparative trial.
Oil palm. Progeny trials of seedlings from crosses between dumpy F_1 and of seedlings from E 206 selfed x (E 268 x E 206) were established at Ulu Bernam (cf. Abst. 583). Seedlings from the cross *tenera* x *tenera* are growing well; *dura* x *pisifera* seed has not however germinated satisfactorily. Seed from crosses of Deli palms with the *pisifera* and *tenera* types has germinated.
Coconut. Final selection of parent palms has been achieved.

187 Montanari, V.
Un grande agronomo Italiano: Nazareno Strampelli. **(A great Italian agronomist, Nazareno Strampelli).**
Agricoltura d. Venezie 1952 : **6** : 302–15.

An account is given of the life and work of the famous Italian plant breeder, who as early as 1900 crossed the two wheats Rieti and Noé in order to produce varieties resistant to rust and lodging. The series of successful wheats which resulted, starting with Carlotta, followed by Ardito, Mentana, and later S. Pastore, Velino, Turano and many others, is quoted in illustration of his success as a breeder, and a number of points are mentioned in which his practical experience led him to formulate principles which now form part of accepted genetical science, including the use of interspecific crossing which led to the wheat varieties Apulia (Rieti x white spelt), Cantore (*Triticum villosum* x Rieti), and Terminillo (Rieti x rye backcrossed to Rieti).

188 Schwanitz, F.
Züchtung und Pflanzenqualität. (**Breeding and plant quality**).
Landw. Forsch. 1952 : 2.Sonderheft : 3–17.

In discussing the many factors which affect quality in agricultural plants reference is made to the polygenic inheritance of most of the characters concerned, and the special methods of determining them in breeding material. It is mentioned that the unpleasant flavour developed by spinach during hot weather is caused by excess of saponin, which can be analysed by rapid hemolytic methods. Marked varietal differences have been detected and improvement of this quality factor by selection should be quite simple. The majority of high-quality forms are distinguished from inferior and from wild forms by greater cell size, and display most of the characteristics of gigas forms; each plant and each character seems to have an optimum cell size, beyond which further increase leads to deterioration; thus in flax, the optimum for oil content is higher than that for fibre. Similarly, the optimum cell size for yield is often not the same as the optimum for certain quality factors such as protein content, so that the two are incompatible genetically. The same considerations make it more probable to find high starch and low protein, thus good malting quality, in barleys with large cells and a long developmental period, in other words the winter barleys, and high protein content, for fodder purposes, in the smaller-celled spring barleys. Again, thick-fleshed, smooth-leaved cabbages have larger cells and have been shown in cooking tests to be of better quality than the curly types, though these are often preferred by the housewife. The advantage of considering cell size as a factor determining quality is that its inheritance is conditioned by one or a limited number of genes.

189 Dorst, J. C.
A questionable novum.
Euphytica, Wageningen 1952 : **1** : 81–83.

Rabbethge and Giesecke Saatzucht G.m.b.H., Einbeck, Germany, breeders and dealers concerned with the Klein Wanzleben sugar beet, have received a patent covering a method of obtaining triploid seed of sugar beet. The patent specification is reproduced in the original wording. The patent is strongly criticized since, contrary to the usual practice of patenting the variety, it applies to a method of production, and the procedure which is claimed to be new is in fact widely known. The general significance of this patent to the question of the legal protection of breeders' rights is discussed.

190 Opsahl, B.
"Brukskrysning" i planteavlen. (**Crossing for heterosis in plant breeding**).
Bondevennen 1952 : **55** : 81–83.

The methods and precautions needed for the production and utilization of F_1 hybrid seed in order to take advantage of the resultant heterosis in various crop plants are explained with special reference to research on beets in Denmark (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 215) and on ryegrass in Holland.

191 Kishore, H.
A note of the chromosome numbers of some plants.
Indian J. Genet. 1951 : **11** : p. 217.

Chromosome numbers of species growing wild near Delhi or Simla have been recorded at the Indian Agricultural Research Institute. Forage types include *Stylosanthes guianensis* ($n = 10$), *Indigofera endecaphylla* ($n = 18$) and *Lotus corniculatus* ($n = 6$). *Valeriana Wallichii* ($n = 14$), *Carthamus oxyacantha* ($n = 12$), *Urginea indica* ($n = 10$) and *Viola serpens* ($n = 6$) have possible medicinal uses.

192 Bremer-Reinders, D. E. and Bremer, G.
Methods used for producing polyploid agricultural plants.
Euphytica, Wageningen 1952 : **1** : 87–94.

A method consisting of short treatment of young seedlings with colchicine solutions at 27° C has been successfully applied to rye, barley, canary grass, sugar beet, flax and buckwheat. The phase-contrast microscope has been used for the recognition of polyploids of sugar beet and rye. Methods of fixing and macerating tissue to produce smear preparations suitable for examination by this means are described.

193 Harvey, P. N.
The practice of arable crop experimentation.
Norfolk Agric. Sta. 1952 : Pp. 79.

Methods developed at Sprowston, Norfolk, England, during 25 years of conducting field trials with cereals, hay, timothy grown for seed, potatoes, sugar beet and linseed are described, with information on plot design, and procedure for marking out trials, crop recording and giving demonstrations.

194 PAL, B. P. and SINGH, H. B.
Some promising recent introductions of crop varieties.
Indian J. Genet. 1951 : **11** : 215–16.

Ridley wheat from Australia, FA 17 and Tie Shin Tun sweet potatoes from China, Sioux tomato, Philippine Early cowpea and the USA pea varieties Early Badger and Delwiche Commando are recommended for trial in certain districts, since they have shown promise of adaptability during introduction trials at the Indian Agricultural Research Institute, New Delhi.

195 **Thirty-second report and accounts of the National Institute of Agricultural Botany 1951** : Pp. 42.

Results of varietal trials of spring and winter wheats, oats, and barley and of lucerne, fodder beet, potato, sugar beet, onion, green vegetables, beans and peas are presented. Barley trials included selections from crosses recently made at the Cambridge Plant Breeding Institute. On the basis of results, King II and 298 (15C) winter wheats, Weibulls 4138 spring wheat, Blenda oats and the barley variety HB 35/99/4/10 have been approved, by the Cereal Trials Advisory Committee, for the supplementary list of recommendations.

The process of testing wheat varieties for resistance to loose smut has been accelerated by using a vacuum method of infection.

Mention is also made of adaptability trials of various crops in cooperation with the National Agricultural Advisory Service, and reports are given of seed multiplication and the work of the Seed Production Committee and the Official Seed Testing Station for England and Wales.

196 **Annual Report of the Overseas Food Corporation, Scientific Department, Tanganyika, East Africa, for the Crop Year, 1949-50.** 1951 : Sects. 15–18 : Pp. 47 + 36 + 14 + 17. (Mimeographed).

A full report is presented of varietal trials of groundnut and other crops in Tanganyika (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1028).

197 **Variety trials of field beans and buckwheat on Dominion experimental farms and stations 1949-51.**
Min. Rep. No. 126 : Pp. 8.

In trials of buckwheat on stations in eastern Canada the rough-hulled variety Welsford has outyielded all others; three Japanese varieties have yielded more than Silverhull selections.

Data are also presented on field bean trials at various Canadian stations, using Robust as a standard. Clipper (Beauty x Burbank) has yielded well in all regions except New Brunswick, where an earlier maturing variety is required. Differential varietal reactions to anthracnose, common blight and halo blight were also noted.

198 HANSEN, H. H. H.
Lokale forsøg og andre planteavlsarbejder (**Local trials and other work of plant cultivation**).
Planteavl, Lolland-Falster 1951 (1952) : 15–130.

This review includes detailed reports showing the results of manurial experiments and variety trials of clover, lucerne, bread cereals, maize and sugar beet (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1739).

In two sugar beet trials, run on behalf of the Nykobing Sugar Factory, the polyploid, Kleinwanzleben Poly, gave the highest yield of roots, sugar and tops per ha., and also had the highest sugar content, ½% more than Maribo N and Kleinwanzleben N. Its most likely competitor is probably Maribo P, another polyploid.

CEREALS

199 MORRIS, G. P.
Descriptions and diagrams of wheat and barley varieties.
J. Nat. Inst. Agric. Bot. 1951 : **6** : 20–28.

Detailed descriptions of Freja barley and the wheat varieties Staring, Nord Desprez, Pilot and Hybrid 46 bring up to date the list of published descriptions of varieties recommended for different parts of the United Kingdom (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1256).

200 GRAFIUS, J. E.
A statistical model for estimating components of genetic variance in bulk yield tests of self-pollinated small grains.
Tech. Bull. S. Dak. Agric. Exp. Sta. 1952 : No. 9 : Pp. 13.

Details are given of a method for estimating the components of genetic variance between self-pollinated bulked progenies from crosses of isogenic lines. The limiting assumptions are briefly discussed.

201 Calabresi, G. A.
Stazione Fitotecnica di Sant'Angelo Lodigiano. **(The Plant Breeding Station of Sant'Angelo Lodigiano).**
Riso, Milano 1952 : **1** : No. 6 : 22–24.

The writer records his impressions of a visit to this institute in Lombardy and the achievements of Forlani in the interspecific hybridization of cereals. The institute is to collaborate in the production of improved rice seed.

202 Maheshwari, P.
Lysenko's latest discovery—the conversion of wheat into rye, barley and oats.
Nature, Lond. 1952 : **170** : 66–68.

Critical comments are made on Lysenko's claims concerning specific and generic conversions in cereals (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2500). It is argued that the conversions said to have occurred as a result of environmental influences only are impossible, and that if occasional grains of barley, oats or rye do occur in wheat spikes, their presence can be explained on the basis of androgenesis.

203 Hjelmqvist, H.
Några sädeskornsavtryck från Sydsveriges stenålder. **(Some imprints of cereals from the stone age in Southern Sweden).**
Bot. Notiser 1952 : No. **3** : 330–38.

Swedish pottery from neolithic times has been found to bear impressions of naked barley, a form of *Hordeum polystichum*; *Triticum dicoccum*; *T. monococcum*; *Bromus secalinus*; and *Malus communis*. The historical and agricultural implications are discussed.

204 Åkerman, Å., Tedin, O., Fröier, K. and Julén, G.
Fem års försök på Tagelsgård, Utsädesföreningens substation på småländska höglandet. **(Five years' experiments at Tagel Farm, the substation of the Swedish Seed Association in the Småland highlands).**
Sverig. Utsädesfören. Tidskr. 1952 : **62** : 152–85.

An account is given of the establishment of the above station with a view to the production of varieties of cereals, fibre flax and herbage plants suitable for the relatively severe climate and inferior soils of the Småland highlands. The results of variety trials of autumn and spring wheats, autumn rye, oats, barley, flax and herbage plants are given, with observations on the aims in future breeding.

205 Lysenko, T. D.
(Changing nonhardy spring varieties into hardy winter varieties).
Agrobiologija (Agrobiology) 1952 : No. 4 : 3–11. [Russian].

The previously held Mičurinite notion that hardiness is acquired (*a*) gradually and (*b*) under winter conditions is now stated to rest on a theoretical error. It is claimed, however, that the revised method outlined below will enable breeders to produce hardy winter types from spring cereals within two years and avoid the disappointments which attended the earlier experiments.

The improved technique consists in shattering the inheritance of the material by sowing in late autumn and training it in the succeeding generation for either the spring or winter habit. The former objective is achieved by sowing the seed 10 days after the normal sowing date and on several later dates with intervals of 5–7 days between each. Some of this material will reach the green leaf phase in the autumn and acquire new heritable characteristics as a result of photosynthetic activity under abnormal conditions. The first seed generation of such plants will give many winter types with a high degree of hardiness.

206 Saloheimo, L.
Proteini-aneiden vaihtelusta vaaramorenilla ja mutasuoturpeella kasvaneessa viljassa. **(The variation in protein content of cereals grown on upland moraines and on peat).**
Maataloust. Aikakausk. 1949 : **21** : 109–15.

Experiments on the cultivation of several varieties of spring wheat, barley and oats on peat and on mineral soils in Finland are described. Data are given for yields of straw and grain and for dry weight and protein content of the seed.

207 Grafius, J. E. and Dirks, V. A.
An analysis of small grain performance in South Dakota 1942-1951.
Bull. S. Dak. Agric. Exp. Sta. 1952 : No. 422 : Pp. 23.

Data on the performance of varieties of wheat, oats, rye, barley and linseed grown at four stations in South Dakota during the past ten years show that a few varieties, bred specifically for the region, have consistently yielded well under fluctuating environmental conditions.

208 Vestergaard, E.
Abed Planteavlsstation. **(Abed Plant Breeding Station).**
Beretn. Planteavl. Loll.-Falster 1951 (1952) : 5–14.

The current report (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1753) from this station contains the following information:—

Wheat. The hybrids under observation in the wheat plots include 77 lines from (1) crosses between different varieties and the short-strawed hardy Weibull wheat 9293, which has equalled the Finnish wheats at Abed in hardiness; and (2) Alba x Joncquois, Joncquois x Virtus x Forus, Konge II [King II] x Eroica, Forus x Virtus, Eroica x Joncquois and Jubile [Jubilee] x Forus.

Oats. In competition with Swedish and Danish varieties the Svalöf oat Örn [Eagle] yielded 513 hkg. per ha. The most recent results from national trials of oat varieties have already been recorded (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 995).

Breeding material has been reduced to a relatively small collection of varieties for further testing. The variety Palu (Örn x Minor), which was not a success on ordinary arable land, exceeded Örn by about 10% in grain yield on boggy soil; this was due to its stiff straw and resistance to frit fly. It was put on the market in 1951 as a special variety for bog land.

Abed 6–36 (Minor x Abed 30) again gave a high yield of grain.

Experiments with a new line of Palu and another from 9–236 (Örn x Minor) will be continued.

Barley. The government trials of Danish and Swedish barleys have already been reviewed (cf. Abst. 349).

The performance is recorded of 17 selections, obtained mainly from crosses of Danish and Swedish varieties, but in some instances from other combinations or selections.

Abed 7–38 (Archer x Kenia) has given the highest and the most reliable yield during four years of testing and it is as stiff-strawed as Herta. Another good selection, judging by the results for two years, is Abed 8–9 (Abed 317 x Isaria).

Among the newer selections made in 1949 one line, Abed 9–183 from Kenia, held its own in competition with Herta.

A German variety Heine's Pirol underwent its first test; its straw is as long as that of Herta, but stiffer. Crosses with Pirol are in progress. Seed of Denso barley, a very compact, short strawed type of Rigel, has been renewed, and lines of Denso x Weihenstephaner II resembling Denso have been selected, but their reaction to mildew is not yet known. A Denso mutant, a light green type with no waxy bloom, has also been used in hybridization.

WHEAT

209 Smith, L.
A rare dominant chlorophyll mutant in durum wheat.
J. Hered. 1952 : **43** : 125–28.

A detailed study has been made of a chimeral mutant (X_1) of Carleton ($2n = 28$) obtained after exposing seed to atomic bomb irradiation at Bikini in 1946 (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 177). The young leaves had yellow-green stripes which became golden as the leaves matured. The selfed X_2 consisted of 75% self-coloured golden plants. Reciprocal crosses between the latter and normal plants gave segregation ratios indicating that the golden variant was the result of an induced dominant mutation; the gene symbol *Go* has been approved for this mutant.

210 Téllez Molina, R.
Ensayos comparativos de rendimientos de trigos híbridos. **(Comparative yield tests of hybrid wheats).**
An. Inst. Invest. Agron., Madr. 1952 : **1** : 185–215.

Regional tests of the wheat hybrids produced by the Centro de Cerealicultura [Cericulture Centre] in Madrid were initiated in 1949–50 and the full results for that year and for 1950–51 are here presented. None of the hybrids was as good as the French wheat Schribaux J–1 in the northern section of the Spanish plateau. In the southern section hybrids of the 100 series proved excellent, particularly 100–30 and 100–38, and in certain places hybrid 154–17. The varieties serving as standards were Candeal Alcalá and Aragón 0–3, with Mentana, L–4 and J–1 as subsidiary standards.

New selection centres have been established in Valladolid, Albacete and the Cuenca del Ebro. Both hard wheats and bread wheats are being considered.

211 Nikolaeva, T.
(The winter wheat Stepnaja 135).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 7 : 59–60. [Russian].

Stepnaja 135 [Steppe 135], which was derived by individual selection and training from a mutant of Hostianum 237 at the Dokučaev Institute of Agriculture of the Central Black-Earth Belt, has outyielded other wheat standards in recent trials in the Voronež, Saratov, Kuĭbyšev and Kursk provinces. It yields 47–51·7 c per ha. when grown upon irrigated land.

212 Litovčenko, A. L.
(Alternative wheats in the Ukraine).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 6 : 46–48. [Russian].

Testing western Ukrainian alternative wheats as breeding material is advocated. These wheats are normally grown for 2–3 years as a winter crop and then for 1 year as a spring cereal. They have a larger grain and are more productive when grown as winter wheats but their alternative use keeps down contamination of the fields with rye.

213 Parnačev, P. V.
(Changing the inheritance of winter wheats by sowing in the spring).
Agrobiologija (Agrobiology) 1952 : No. 4 : 63–65. [Russian].

Development of spring types from the winter wheats Durable and Lutescens 1866 in the Autonomous Komi SSR is described. Both varieties were sown, before their seed completed vernalization, as normal spring wheats. In September, because of the cold weather, early-earing plants were transferred to a glasshouse, where some plants reached maturity and yielded viable seed.

Morphological changes occurred in a plant derived from Lutescens 1866. It was a *Triticum cyanothrix* type and bore three small ears which were notable for early maturity. In the succeeding generation the seed of this early form gave however no *cyanothrix* types, but some *lutescens*, *velutinum*, *erythrospermum* and *hostianum* plants instead. Some of the material produced mature grain under Komi conditions. Durable produced *erythrospermum*, *lutescens*, *milturum* and *ferrugineum* forms, and Lutescens 1866, *milturum*, *caesium*, *erythrospermum* and *ferrugineum* types in the second year.

214 Åkerman, Å.
Svalöfs höstvetesorter. Erfarenheter om deras odlingsvärde från fältförsök och laboratorieundersökningar. **(Svalöf winter wheats. Experience regarding their cultivation value from field trials and laboratory investigations).**
Svalöf Katalog för Hösten 1951. Allm. Svenska UtsädesAB, Svalöf 1951 : 2–3.

The merits of the wheats Skandia III élite B and Hansa, bred by the Swedish Seed Association, and Odin, a Weibull product, are set out with recommendations regarding the districts in Sweden to which they are best adapted.

215 Laude, H. H. and Schlehuber, A. M. *et al.*
Ponca winter wheat.
Bull. Okla. Agric. Exp. Sta. 1952 : No. B–380 : Pp. 14.

A full account is given of the new wheat Ponca (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1096) which combines the good milling and baking qualities of Marquis and Turkey, two of the many wheats contributing to its pedigree. The particular cross from which Ponca was eventually selected was made in 1935 between (Kawvale x Marquillo) and (Kawvale x Tenmarq).

216 Pesola, V. A. and Honkavaara, T.
Apu-kevätvehnä uusi, aikainen kevätvehnälajike. **(Apu, a new, early spring wheat variety).**
Maataloud. Koetoim. Tiedonantoja 1952 : No. 228 : Pp. 12.

Experiments with the wheat Apu [Aid], developed at the Jokioinen experimental station from the Canadian variety Garnet x the Finnish variety Pika [Express] are described. It is an early spring wheat which compares favourably with other native and foreign varieties, both with regard to earliness and yield, particularly at stations in mid and north Finland. It can be grown up to the Arctic Circle and is thus regarded as valuable in extending the wheat growing area of the country. Its baking qualities and grain weight are not above average, and it is susceptible to both *Puccinia graminis* and *Ustilago Tritici*.

217 Fukasawa, H.
(The progenies of some new hexaploid wheats).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 6–7. [Japanese].

A cytological examination was made of the progeny from the cross [(*Aegilops ventricosa* x *Triticum durum*) x *T. vulgare*] x *T. vulgare*; 42-chromosome hybrids were studied in particular, the pollen fertility of which ranged from 58 to 88%, the percentage of fertile grain varying between 20 and 86%. A few univalents usually appeared at meoisis in these forms, and a single multivalent was also frequently observed.

The 42-chromosome plants were selfed, and also crossed both ways with *T. vulgare*. Progenies were also reared from 43-chromosome plants from the same complex cross. Data are provided on meiosis in the 42-chromosome offspring of these last-mentioned crosses. It is noted that meiosis is most regular and fertility highest in the cross involving *T. vulgare* as the female parent. The lower fertility of the reciprocal is attributed to plasmatic effects. Several of the resulting hybrids were found to have a 100 grain weight considerably greater than that of the control *T. vulgare* plants.

218 KATAYAMA, Y.
(On the genome of a triple rye-wheat).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 14–15. [Japanese].

Triticum turgidum was crossed with *Secale cereale* and the hybrid crossed in turn to *T. vulgare*. A 42-chromosome wheat in which 2 univalents were frequently observed was obtained, and this was back-crossed to *T. vulgare* and to rye. From the back cross to *T. vulgare*, plants were obtained with 8–12 univalents. The light that these findings throw on the genome relations of wheat and rye is discussed.

219 ARTEMOVA, A. S. and JAKOVLEV, A. V.
(The prospects of cultivating the winter wheat-*Agropyron* hybrid 186 in the south of Kazahstan).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 4 : 11–16. [Russian].

Wheat-*Agropyron* hybrids 599 and 186, which are productive and show resistance to lodging in the Alma-Ata and Taldy-Kurgan provinces, are referred to. Hybrid 599, bred by Cicin, has been made a standard in the mountainous zones of these provinces. Hybrid 186, from the winter wheat Lutescens 329 x *A. glaucum*, has shown promise in trials in the foot hills and the irrigation zone. It is early and has good baking and milling properties. Its 1000 grain weight is 40 to 49 grm.

220 PALMER, T. P.
Population and selection studies in a *Triticum* cross.
Heredity 1952 : **6** : 171–85.

The influence of natural selection on yield components has been investigated at the Crop Research Division, Christchurch, NZ, in offspring of Dreadnought x Cross 7; the parents showed sufficient variability, with respect to grain size, number of grains per ear and number of ears per plant, to allow for combination of the higher yield components of both parents or selection of transgressive segregates with yielding capacity beyond the parental range. A comparison between the parents, F_1, F_2 and F_8, and also between the F_2 and F_3, and the F_8 and F_9, has shown the operation of natural selection for a high number of grains per plant; an increase was noted both in the number of grains per plant and the number of grains per ear. The number of grains proved, however, to be inversely correlated with grain weight. Variability of all yield components of the F_8 was significantly less than in the F_2; thus the influence of segregation, which tends to increase population variances, was outweighed by selection, which tends to decrease all variability. Except for grain weight, correlations between parent and offspring were low and nonsignificant. No consistent differences were observed between F_2–F_3 and F_8–F_9 correlations.
The increase in the proportion of homozygous plants resulting from natural bulk selection has certain practical advantages for the breeder; in the later stages of single plant selection the number of generations can be reduced, while the absence of unwanted segregates simplifies the development of pure lines.

221 MAZZONI, G.
Rilievi biologici su frumenti italiani in coltura nello Scioa (Etiopia): un interessante caso di selezione dell'ambiente sul frumento Villa Glori. [**Biological notes on Italian wheats grown in the Scioa region (Abyssinia): an interesting case of selection by the environment on Villa Glori wheat**].
Riv. Agric. Subtrop. 1946 : **40** : 12–18.

By growing two samples of Villa Glori, one from Bologna and the other from central Italy, at Scioa, the author discovered that the two stocks differed in the relative proportions of early, intermediate or late lines, as expressed under Abyssinian conditions.

222 **Breeds new wheat.**
Canad. Grain J. 1952 : **8** : No. 1 : p. 28.

An exceptionally early maturing wheat, named Early Harvest, has been selected at Jarvie, Alta., where it produces ears seven weeks after sowing and can be harvested at the beginning of August. Under good conditions it yields 40–45 bushels per acre.

223 MATSUMURA, S.
(The relation between the quality of X ray illumination and chromosome aberrations).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 28–29. [Japanese].

Triticum monococcum was illuminated with a constant dose (8100 r.) of X irradiation, but under different conditions of voltage, time of illumination and distance from the source of illumination. The number of aberrations was higher when higher voltages were used.

224 Sachs, L.
Chromosome mosaics in experimental amphiploids in the *Triticinae.*
Heredity 1952 : **6** : 157–70.

The occurrence, distribution and inheritance of chromosome mosaics has been studied at Cambridge, England, in colchicine-induced amphiploids derived from F_1 hybrids between numerous species of *Triticum*, *Aegilops* and *Agropyron* (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1747). At meiosis the anthers of 19 out of 24 new amphiploids contained a mixture of cells with the complete chromosome complement and various reduced aneuploid complements; the greatest difference observed was a range from 56 to 9 chromosomes. Although mosaics were more common in the 8*x* than in the 6*x* individuals, none were observed in the 10*x* amphiploids, indicating that they are not merely dependent on a high chromosome number, but rather on certain gene combinations. Since aneuploid cells are apparent at early stages of meiosis it is assumed that they originate at divisions immediately preceding meiosis, and are probably due to genetically determined spindle abnormalities. Meiosis occurred simultaneously in all pollen mother cells, regardless of chromosome complement, and gametes with a wide range of chromosome number were produced, giving rise to F_1 aneuploids. Some aneuploids having only a slight reduction in chromosome number proved fertile, but others showed a high frequency of univalents and proved sterile. One plant with 28 chromosomes was obtained from the amphiploid *T. Timopheevi* x *T. turanicum* ($2n = 56$); it proved similar in all respects to the F_1 hybrid parent from which the amphiploid was derived, and had lost the capacity to produce chromosome mosaics. Other amphiploids, including *T. Timopheevi* x *Ae. bicornis* ($2n = 42$), produced mosaics in three successive generations under different environmental conditions at Cambridge, at Lund, Sweden, and at Szechuan, China.

Although many F_1 aneuploids proved sterile, it is pointed out that in a crop which propagates vegetatively such individuals with varied chromosome constitution would reproduce, giving rise to an extensive range of aneuploid strains.

225 Morrison, J. W. and Unrau, J.
Frequency of micronuclei in pollen quartets of common wheat monosomics.
Canad. J. Bot. 1952 : **30** : 371–78.

Cytological analyses of micronuclei in pollen quartets of 20 different monosomics of Chinese Spring wheat have shown that, at the stage when the pollen mother cell wall still surrounds the tetrad the frequency for any monosome is consistent for different plants, florets and anthers. Certain chromosomes show close similarity in total frequency and distribution of one or more micronuclei per quartet; the frequency with which monosomes split at anaphase I, and exhibit lagging at anaphase II, is also correlated with micronucleus formation in each of three such groups of chromosomes. It appears, therefore, that there is considerable basic similarity among each of the series of chromosomes originally comprising the three genomes from which common wheat was derived (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 829); factors still showing inherent similarities are, however, mainly concerned with chromosome orientation and movement.

Univalent fragmentation during anaphase I and II is thought to be responsible for the presence of quartets with three or four micronuclei, although it has been suggested that some of the micronuclei may originate from chromosomes other than the monosome.

226 Kimura, M.
(Meiosis in haploid Einkorn wheat).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 17–18. [Japanese].

The course of meiosis in haploid *Triticum monococcum* is described. Most of the chromosomes appear as univalents at metaphase, though a few bivalents and higher associations also occur.

227 Demišev, K. S.
(The problem of perennial gramineaceous plants).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 6 : 15–21. [Russian].

Development of perennial forms of wheat and rye at the Kabarda State Breeding Station by environmental training, without wide hybridization, is reported. Some productive forms of rye of the perennial type were derived from the winter rye Kabardinka [Kabarda] and the hybrid Kabardinka x Stål [Steel]. They have borne normally developed grains with a 1000 kernel weight of 24–32 grm. and transmitted the perennial habit to 81–100% of the sexual progeny.

The seed progeny of the perennial rye segregated in respect of many characters, including branched and other abnormal types of ear. Some progeny produced culms with several ears each, and others bore ears resembling panicles.

The latter plants did not resemble rye or any other plant of the Hordeeae. The material investigated gave more types with branched ears and culms bearing several ears in the later generations, and is being multiplied in the hope that it will give a productive perennial rye adapted to the climate of the Caucasian foothills. References are made to an instance of conversion of rye into *Bromus inermis* and to a perennial wheat obtained by environmental training of a productive line of Lutescens 907. The perennial wheat had longer ears, bearing 35–38 large grains, than Lutescens 907. It produced grain two years in succession, but was incapable of surviving for a longer period. The experiments suggest that training wheat for the perennial habit is more arduous than with rye.

228 SUETSUGU, I. and NAKAZAWA, A.
(On the significance of nursery selection based on the number of tillers in wheat breeding experiments. II. Experimental results of breeding strains).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 335–38. [Japanese].

Correlations have been studied between number of tillers and number of ears in strains with many and with few tillers. Nursery selection based on tiller number is feasible though subject to various limitations.

229 HMELEV, B. I.
(Vegetative rapprochement by the method of embryo transplantation).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 10–15. [Russian].

Vegetative rapprochement improved the compatibility between hard and soft wheats at the Ivanovka, Ramonj and Nemerčanskaja Breeding Stations and the USSR Scientific Research Institute of Sugar Beet. It was found that grafting the embryo of one species on to the endosperm of the other was more efficacious if the first seed generation (V_1) of the grafted material was hybridized rather than the grafted generation (V_0) itself. The effect of vegetative rapprochement upon crossability was further intensified by grafting the material for a second time before making the cross. The material comprised (Narodnaja [People's] on Lutescens 62) x Lutescens 62, (Melanopus 69 on Lutescens 62) x Lutescens 62, V_1 (Lutescens 62 on Melanopus 69) x Arnautka Nemerčanskaja, V_1 (Lutescens 62 on Melanopus 69) x Melanopus 69 and [(Melanopus 69 on Lutescens 62) on Lutescens 62] x (Lutescens 62 on hard wheat 153/43). [(Melanopus 69 on Melanopus 69) on Melanopus 69] x Lutescens was the control in the last instance.

230 HMELEV, B. I.
(Vegetative rapprochement in distant hybridization of wheat).
Agrobiologija (Agrobiology) 1952 : No. 4 : 139–42. [Russian].

At the Ivanovka Breeding Station embryos of the wheat Narodnaja [People's] were grafted on endosperms of the soft spring wheat Lutescens 62 and then pollinated with pollen of Lutescens 62. The controls produced smaller and less healthy-looking grains, and their percentage of malformed seed was higher. Analysis of the F_1 material showed that (Narodnaja on Lutescens 62) x Lutescens 62 gave more viable seed with a higher percentage of survival and stronger plants with taller straw, longer ears and more and larger grains than (Narodnaja on Narodnaja) x Lutescens 62. The analyses of the F_2 gave similar results.

The F_0 (Lutescens 62 on Melanopus 69) was sown in a mixed field with Melanopus 69, at Ivanovka, and with Arnautka Nemerčanskaja, at Nemerčansk. The material obtained showed a higher degree of fertility and was more vigorous and productive and had a higher 1000 seed weight than the controls. Later generations of the grafted plants crossed more readily with hard wheats.

231 NEČIPORČUK, I. D.
(Some external conditions promoting modifications of branching wheat).
Agrobiologija (Agrobiology) 1952 : No. 4 : 119–21. [Russian].

The effects of different sowing dates upon the loss of the branching habit in branched plants of *Triticum turgidum*, and the conversion of this species into other wheats have been investigated at the Ljvov Agricultural Institute. The evidence suggests that conversion into other species was least frequent when the branched wheat was sown in late autumn or early spring. In the former instance the nonbranching forms obtained comprised some *T. durum* plants of var. *hordeiforme* and a few individuals of *T. vulgare* var. *erythrospermum*, and in the latter a few soft wheat plants of vars. *erythrospermum*, *lutescens* and *milturum* and 1·3% plants of the spring rye type.

Branched *T. turgidum* sown in December gave hard wheats of the *hordeiforme* and *melanopus* types and soft wheat of the *erythrospermum*, *lutescens* and *milturum* types, besides some rye and barley plants. Nonbranching forms were also developed in spring sowings and consisted of vars. *hordeiforme* and *melanopus* of hard wheat and vars. *lutescens* and *erythrospermum* of soft wheat.

When sown in December, seed of *T. turgidum* with a vitreous endosperm was more susceptible to modification than seed with a mealy endosperm.

232 Muhin, N. D.
(Changing normal soft spring wheats into branching forms).
Agrobiologija (Agrobiology) 1952 : No. 4 : 114–19. [Russian].

Mičurinite training of wheats for productive ears at the White Russian State Breeding Station is described. Of the twenty varieties which were grown upon rich soil dressed with nitrogenous and other fertilizers, K–542 produced 21 and E–1320 14 branching ears in the first year. The branching ears of the former had a 20·6% higher weight than the normal ears and bore 19·3% more grains. The respective percentages for E–1320 (Ledovka x Lutescens 62) were 25·4% and 36·3%. The development of the branching habit was observed in eight other varieties and was intensified in K–542 and E–1320 when the treatment was repeated in the succeeding year. In another experiment, 10 hybrids involving nonbranching parents only, were also induced to produce branching ears. Some of these ears bore over 60 grains each. Branching ears were dominant in the F_1 hybrids Milturum 2 x Vetvistaja Kahetinskaja [Branching Kahetian] and E 1320 x Vetvistaja Kahetinskaja, when the material was trained as above. Similarly, K–542 x Vetvistaja Kahetinskaja produced ten plants of the branching type in the F_1.

233 Zelenskiĭ, M. A.
(The development and inheritance of the large grain character in wheat and rye).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 4 : 8–11. [Russian].

Mičurinite breeding of cereals for large grain (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1800) has continued at the Kiev Agricultural Institute. The present experiments with unspecified varieties of wheat and rye showed that the most marked improvement in the size and quality of the grain was obtained by removing the distal half of each ear and cultivating the plants upon a rich soil. The changes obtained were heritable. The F_1 gave more vigorous and productive plants, with a higher 1000 seed weight. The grain size of the F_2 was further increased by a similar treatment of the F_1 plants.

234 Copp, L. G. L. and Wright, G. M.
The inheritance of kernel weight in a *Triticum vulgare* cross.
Heredity 1952 : **6** : 187–99.

Data concerning grain weight of the F_1, F_2 and F_3 of (India 29, S 1556 x Crete 2, S 357) have been analysed using the biometrical methods developed by Mather (cf. *Plant Breeding Abstracts*, Vol. XIX, p. 913). The original cross was one of four reciprocal crosses made at the Wheat Research Institute, Lincoln, NZ, for a preliminary study (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 218). Although large numbers of individuals were grown, estimates of the genetic and environmental components of variation were not sufficiently precise to enable definite conclusions to be drawn regarding either the number of segregating genes involved, their linkage relationships or the possible limits to selection.

Residual genic interaction has been accepted as the most probable explanation for the lack of success.

235 Hoeser, K.
Weizenproduktion und Backqualität in unserem Lebensraum sowie in den wichtigsten weizenbauenden Ländern der Erde. **(Wheat production and baking quality in our territory and in the most important wheat growing countries of the world).**
Landw. Jb. Bayern 1952 : **29** : 485–502.

The various factors which contribute towards high baking quality are discussed. Breeding work at the Weihenstephan institute in Bavaria suggested that many of the factors are correlated with reduced yielding ability but many successful wheats combining quality and yield have been produced recently and their cultivation has steadily risen during the last ten years. The position in other countries is briefly analysed.

236 Fajersson, F.
Några data om vetets örighet. **(Some data on grittiness of wheat).**
Lantmannen, Stockholm 1952 : **36** : p. 483.

Grittiness of wheat flour is defined as the absence of a tendency to form lumps during storage. O. Berg's work at Weibullsholm (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 842) on the role of the variety in determining grittiness, its genetic basis, and the relation between protein content and grittiness is cited.

The grittiness of different Swedish wheats is compared.

237 Maes, E.
Recherches concernant la valeur boulangère des races sélectionnées de froment belge. **(Investigations concerning the baking value of improved varieties of Belgian wheat).**
Rev. Agric., Brux. 1952 : **5** : 783–91.

Preliminary tests of the baking quality of samples of winter and spring wheats from the plant breeding stations at Gembloux and Heverlé have shown the following to be superior in baking quality and thus of possible value for cross breeding: Alba, Blé d'Avril [April Wheat], Blé d'Or [Golden Wheat], Fylgia and Koga.

238 Rebischung, J. and Karska, K.
Étude de la valeur systématique de quelques caractères observables sur le grain et les plantules de blé tendre. **(Study of the systematic value of some characteristics observable in the grain and seedlings of soft wheat).**
Ann. Inst. Nat. Rech. Agron., Paris 1952 : **2** : 1–30.

From a study of a number of wheat varieties grown in France a key which can be used for their rapid identification has been drawn up. The diagnosis is based on characters such as dimensions of the grain and of the seedling and its leaves, dimensions and the intensity of coloration of the coleoptile.

239 Ayers, A. D., Brown, J. W. and Wadleigh, C. H.
Salt tolerance of barley and wheat in soil plots receiving several salinization regimes.
Agron. J. 1952 : **44** : 307–10.

Germination of four varieties of barley and two of wheat was delayed by adding 5000–10,000 ppm. salt to irrigation water at the US Salinity Laboratory, Riverside, Calif. An increase to 20,000 ppm. had lethal effects on all seedlings except the barley varieties California Mariout and Hank; these gave reasonable grain yields and are therefore recommended for land reclaimed from excessive salinity.

240 Lovčikov, I. S. and Budjuk, V. P.
(The best varieties of spring wheat for the irrigated fields of the South-east and of the Central Black-earth Belt).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 3–6. [Russian].

Several wheats recommended by the State Commission for Varietal Trials for cultivation on irrigated land are described. The soft wheats Albidum 43 and Lutescens 758 were bred at the Institue of Agriculture of the Southeast, Bezenčukskaja 98 [Bezenčuk 98] was developed at the Bezenčuk State Breeding Station, while the hard wheat Melanopus 69 was bred at the Krasnyĭ Kut State Breeding Station, Donskaja Garnovka 672 [Don Garnovka 672] at the Rostov, Čakinskaja 226 at the Čakinskaja and Narodnaja [People's] at the Harjkov State Breeding Station. All these varieties are productive, have good quality grain and carry resistance to lodging, shedding and fungous diseases, when grown under irrigation.

241 Sato, T.
(Studies on the cultivation of crops in cold highlands. I. On the cultivation of wheat).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 267–70. [Japanese].

Data are given on the performance of a series of Japanese winter and spring wheats in the bleak region of Nobeyama, both with and without phosphate fertilizer. The winter wheats yielded better than the spring wheats, the more winter hardy varieties being those in which the top: root ratio was low during winter. Phosphate fertilizers were of advantage in promoting root growth as compared with top development.

242 Reitz, L. P. and Webster, O. J.
Four new fall grains for Nebraska.
Neb. Exp. Sta. Quart. 1952 : **1** : 6–7, 16.

The new winter wheat Sioux, Pierre rye (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts. 325 and 326) and two new winter barleys, Kearney and Dicktoo, are recommended to growers in Nebraska. Sioux (CI 12142) is a very hardy wheat selected from the cross Cheyenne x Turkey; it matures at the same time as both parents and has a high degree of bunt resistance. In quality tests the flour is equal or superior to standard varieties. Sioux is well-adapted to western Nebraska where it outyields Turkey and Pawnee and gives the same grain weight per bushel as Cheyenne. Kearney barley (CI 7580) was developed at Lincoln, Neb., from a composite cross. The other barley, Dicktoo (CI 5529) was obtained as a selection from a nursery at Dickinson, N. Dak., and increased at Lincoln for release. Both Kearney and Dicktoo are extremely winter hardy, showing an average survival of 75% in severe winters when only

15% of the commonly grown varieties Reno and Ward survived.

243 Cvetkov, M. I.
(The training of spring crops for hardiness).
Agrobiologija (Agrobiology) 1952 : No. **4** : 52–55. [Russian].

At Krugan, Moscow and Barnaul, several cereal and soya bean varieties and a pea were trained for earliness and hardiness. The method consisted of soaking the seed in warm water for six hours and treating the seed first for 48 hours at 18–20° C and then for 15–18 days at 0° C. Afterwards the seed was sown 15 days earlier than the normal spring sowing date. The altered breeding material, which became appreciably earlier than the initial varieties, included the wheats Milturum 553 and Caesium 1519/10, a branching wheat and a soya bean variety.

244 Nakagawa, M.
(Studies on the scab resistance of wheat varieties. I. On the angle between the first and second seedling leaves).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 115–18. [Japanese].

An inverse correlation has been detected between the size of the angle subtended by the first two leaves of Japanese wheat varieties 10 days after germination and resistance of the adult plant to scab (*Gibberella*). The reason for the correlation is obscure.

245 Warmbrunn, K.
Untersuchungen über den Zwergsteinbrand. **(Investigations on dwarf bunt).**
Phytopath. Z. 1952 : **19** : 441–82.

American findings on varietal resistance of wheat to dwarf bunt are briefly reviewed together with the results of German experiments on the resistance of varieties of wheat and spelt in Germany. No adequate resistance, from the standpoint of future breeding of resistant varieties, was found in any of the German wheats. Wahrberger Ruf [Wahrberger Renown], which was only very slightly affected in 1948, showed increased susceptibility in 1949. The spelts had the highest incidence of attack in 1948, but on the other hand, in 1949, inspection of some varieties, not included in the experiment, showed them to be almost disease free.

No correlation between varietal resistance to bunt and to dwarf bunt was observed. Only the Hohenheimer strain 29 (Hohenheimer 77 x Hohenheimer Dickkopf), which probably acquired its bunt resistance from Hohenheimer 77, was not attacked by dwarf bunt in 1948, 1949 or 1950.

One of the difficulties of testing for resistance is the lack of a reliable method of artificial infection.

The problem of the botanical status of the form of *Tilletia Tritici* causing dwarf bunt is also discussed.

246 Borlaug, N. E., Campos T., A. and Bayles, B. B.
Mexican varieties of wheat resistant to race 15B of stem rust.
Plant Dis. Reptr 1952 : **36** : 147–50.

Among the varieties in commercial sowings in Mexico, Kentana 48 (Kenya Rojo RF–324 x Mentana), and Lerma 50, a selection from the second back cross of Kentana to Mentana, were extremely resistant to race 15B and other races of stem rust during the severe epidemic in 1951. Varieties possessing the Newthatch type of resistance were highly susceptible; Supremo, whose stem rust resistance was derived from Surpresa and Hope, was also very susceptible; these varieties have shown field resistance to all races of stem rust in Mexico except 15B. Breeding material consisting of the following was tested for resistance during 1951 at four centres in Mexico: 1007 of the most promising lines and standard varieties from Canada and the United States; 4702 foreign introductions from the world collection of the US Department of Agriculture; and 200 miscellaneous introductions and lines from South American countries. Wheats found to be resistant include some parents and lines in use in North America and a number of *Triticum vulgare* and *T. durum* introductions from the world collection.

247 Thomas, I. and Reeves, J.
New cereal varieties in Australia.
J. Dep. Agric. W. Aust. 1952 : **1** : 391–92.

Detailed descriptions are given of five varieties of wheat submitted for registration in Australia. Panther, a late maturing variety bred at the Waite Agricultural Research Institute, Adelaide, was developed from Nabawa x (Riverina x Hope). It is resistant to leaf rust, to stem rust races 126 and 126B and the complex which originated in New South Wales in 1948, and produces flour of superior baking quality.

An early maturing variety giving high yields under good rainfall conditions was bred from Ford x Dundee at Roseworthy College, South Australia and designated Dirk. This variety proved very susceptible to disease and was crossed with Gabo to incorporate resistance to stem rust races 126 and 126B; four back crosses to Dirk were necessary to regain the desirable qualities of the latter, and the final selection has been named Dirk 48.

Insignia 49 is another early maturing variety deriving its resistance to stem rust races 126 and 126B from Gabo. The new variety was developed at the Waite Agricultural Institute from a cross between Insignia and Gabo, backcrossed five times to Insignia.

The fifth variety, Festival, has already been described (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1814); it originated from the cross Pusa 111 x (Kenya C 6041 x Baringa).

248 JONES, D. K.
Better varieties of wheat.
Countryman, Nicosia 1952 : **6** : No. 8 : 13–15.

A brief and popular account is given of crossing techniques and methods of selection used in Cyprus, where high yielding varieties well-suited to local conditions but only slightly resistant to common races of rust are being crossed with rust resistant introductions.

249 ROSSER, D.
Spica—a new wheat variety.
Qd Agric. J. 1952 : **75** : 1–5.

A detailed description is given of Spica, an early maturing variety developed at Hermitage, Qd., from (Three Seas x Kamburico) x (Pusa x Flora 3202). It possesses a high degree of resistance to leaf rust and has remained almost immune from all prevalent races of stem rust. During trials in the past five years Spica has consistently yielded as well as Gabo and is adaptable to various weather conditions. As a grain variety it is recommended to replace Puora, Seafoam and other rust susceptible wheats of similar maturity; the ears are, however, prominently awned so that it is not suitable for hay. The flour is of good gluten strength and well-suited to bread-making.

250 PESOLA, V. A. and KIVI, E. I.
Tutkimus mustanruosteen tuhoista v. 1951 lounais-Suomessa, erityisesti lajikkeita ja vahingon määrää silmälläpitäen. **(Investigations into the damage in 1951 by black rust in southwest Finland, especially with regard to varieties and the extent of the damage).**
Maatalous, Helsinki 1952 : No. 1 : 7–12.

Data are given on the effect of infestation by *Puccinia graminis* on the size and yield of grain, on germinating capacity and on quality of flour for several varieties of spring wheat grown in various areas of southwest Finland. The varieties include a number of native Finnish wheats, including the new Apu, Touku and Kiuru wheats from Jokioinen as well as commonly cultivated Swedish varieties. A correlation was apparent between earliness and escape from infection, although all varieties were in fact susceptible. In the case of the relatively late Swedish variety Kärn II [Kernel II], the damage done was offset by its high yielding capacity.

251 Vid Sveriges Utsädesförening samlade erfarenheter från 1951 års svartrostangrepp å vete. **(Collected observations from experience gained at the Swedish Seed Association concerning the 1951 black stem rust epidemic on wheat).**
Sverig. Utsädesfören. Tidskr. 1952 : **62** : 75–151.

Åkerman, Å. I. Inledning och kort sammanfattning av äldre iakttagelser. (I. Introduction and short summary of older observations). (pp. 76–82).

Older outbreaks of *Puccinia graminis* var. *Tritici* in Sweden and the serious 1951 epidemic are reviewed, with notes on the resistance shown in 1951 by some Swedish wheats, e.g. 01200, Fylgia and its sister variety Fylgia II (0972_c), whose resistance appears to be due to transgressive segregation since the parents were not so resistant.

Mac Key, J. II. Svartrosten som växtförädlingsproblem. (II. Black stem rust as a breeding problem). (pp. 83–100).

The subject is reviewed in detail in the light of existing knowledge in Sweden and other countries. The pathogen itself, its identification, races and race mixtures, host plants, and physiological specialization are considered with reference to the problems confronting the Swedish wheat breeder.

Mac Key, J. III. Redogörelse för 1951 *års svartrostangrepp vid Svalöf. (III. Report on the 1951 black stem rust outbreak at Svalöf). (pp. 101–09).*

The effects of the 1951 black stem rust outbreak upon the yield and quality of the numerous varieties in the Svalöf fields are tabulated and discussed. Only one winter wheat, Sv 01460 (Atle spring wheat x Äring), showed satisfactory resistance. Resistant spring wheats included not only Pondus and Fylgia and many other lines in the breeding plots, but also line 48/701 (Ås 076-13 x Diamant II [Diamond II]).

Increased nitrogen manuring did not increase the susceptibility of 15 wheats tested.

Holmgren, O. IV. Redogörelse för 1951 års svartrostangrepp vid Sveriges Utsädesförenings Kalmarfilial. (IV. Report on the 1951 black stem rust outbreak at the Kalmar Branch Station of the Swedish Seed Association). (pp. 110-13).

Comparative statistics for a series of years are cited to show the effects of black stem rust infection in 1951 upon the yield and quality of spring and winter wheats at the Kalmar Station.

Wålstedt, I. V. Redogörelse för 1951 års svartrostangrepp vid Sveriges Utsädesförenings Östgötafilial. (V. Report on the 1951 black stem rust outbreak at the Östgöta Branch Station of the Swedish Seed Association). (pp. 114-31).

The effects of the black stem rust epidemic on agronomic characteristics of spring and winter wheats in Östergötland are recorded, with comments on the resistant varieties and hybrids whose performance suggests that transgressive breeding for resistance is proving effective. The introduction, however, of highly resistant foreign wheats for hybridization purposes in the breeding programme is also thought to be advisable.

Waller, E. VI. Redogörelse för 1951 års svartrostangrepp vid Sveriges Utsädesförenings Västgötafilial. (VI. Report on the 1951 black stem rust outbreak at the Västgöta Branch Station of the Swedish Seed Association). (pp. 132-41).

A detailed account is given of the effects of black stem rust in 1951 upon the wheat harvest at the Västgöta Branch Station and the Nygård and Rådde Substations. The grain yield, 1000 corn weight, hectolitre weight and resistance to mildew and black stem rust of the different varieties tested are shown in tabular form.

Torpe, N. V. VII. Redogörelse för 1951 års svartrostangrepp vid Sveriges Utsädesförenings Värmlandsfilial. (VII. Report on the 1951 black stem rust outbreak at the Värmland Branch Station of the Swedish Seed Association). (pp. 142-45).

Varietal differences in the reaction of 22 spring and 23 winter wheats to black stem rust in trials in Värmland, Sweden, are shown in tables, showing resistance, grain yield, hectolitre weight and 1000 corn weight. The early land wheat Dala proved the most resistant; next came the medium early Sv 48/346 and Drott [King] (= Ög 01140), the early Ås II and Sv 46/1009, and the late variety Kärn II [Kernel II].

Åkerman, Å. and Mac Key, J. VIII. Svartrostresistensen hos det svenska vetesortimentet, bedömd efter 1951 års erfarenheter. (VIII. Black stem rust resistance in the Swedish collection of wheats, estimated on the basis of experiences in 1951). (pp. 146-51).

The severe and extensive epidemic of black stem rust in Sweden in 1951 appears to have been caused by one race or race mixture. The resistance of a number of spring and winter wheat varieties is recorded graphically on the basis of (1) the degree of infection and (2) the decrease in yield. The two methods showed very good agreement; early varieties usually showed greater tolerance than late ones.

252 CHAMBERS, P. C.
Annual Report of the Department of Agriculture, Cyprus, for the year 1951 (1952) : Pp. 16.

The local wheat hybrid Kyperounda again showed superiority in variety trials. The Australian wheat Gabo has exhibited resistance to *Puccinia graminis* and *P. triticina* but susceptibility to *P. glumarum*. Crosses have been made between Gabo and local wheats.

Hybrid maize has not given good results under nonirrigated conditions.

253 RAŠEVSKAJA, V. F. and NILOVA, V. P.
(The effect of catalase activity upon the resistance of wheat to brown rust).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1952 : No. 4 : 63-67. [Russian].

In artificial infection trials race 17 of brown rust developed at a slower rate on Hordeiforme 10 and Fulhart than on Lutescens 62, Milturum 321 and Ukrainka [Ukrainian].

It was found that *Puccinia triticina* developed more rapidly on tissues with a high catalase activity.

254 ZAMKOVOĬ, G. T.
(Breeding spring wheat in the Far East).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 6 : 21-30. [Russian].

Breeding spring wheats for firm straw, productive ears and resistance to rust at the Far

Eastern Agricultural Institute involved Mičurinite training of winter wheats for the spring habit and various vernalization treatments. Some promising material was obtained from Barnauljskaja [Barnaul], Kooperatorka [Cooperator], Kubanskaja 131 [Kubanj 131] and Kubanskaja 133. All the above varieties produced spring forms of the *erythrospermum* type, and Barnauljskaja gave also some *lutescens* and *milturum* forms. The spring types developed from Kooperatorka, Kubanskaja 131 and Kubanskaja 133 carried resistance to rust and had shorter straw and more spikelets and grains per ear than standard Lutescens 62.

255 Gadea, M.
Tres años de experiencias con nuevas variedades de trigo. **(Three years of tests with new wheat varieties).**
An. Inst. Invest. Agron., Madr. 1952 : **1** : 1–182.

Full results are presented of tests carried out from 1948 to 1950–51 in different localities throughout Spain with a number of wheat varieties, including hybrid varieties introduced from Italy and elsewhere as well as some produced locally. Consideration was given to such features as tillering, standing capacity and attack by rust, birds and drought as well as yielding capacity, and in discussing the results, which naturally varied in the different years, recommendations are made as to varieties which would merit further attention.

256 Murty, G. S. and Deshmukh, M. J.
Trials of improved wheat varieties in India. I. Suitability of some improved varieties and local types to different wheat-growing regions, based on data collected from 1905 to 1948.
Indian J. Genet. 1951 : **11** : 136–84.

Tabulated data are presented on the performance of varieties in different regions of 11 states from 1905 to 1948, with special reference to those varieties which are well-adapted to each district.

257 Ciumei, G.
La sperimentazione granaria in provincia di Pistoia nella campagna 1951–1952. **(Wheat trials in the Province of Pistoia in the season 1951-52).**
Agricoltura Tosc. 1952 : **7** : 268–70.

The performance is recorded of 11 Italian wheats in three observation trials in which vegetative development, yields of grain and straw, and the incidence of lodging and rust were noted. The varieties Mara and R/37 are specially recommended for their resistance to lodging and rust in combination with high yield.

BUCKWHEAT

258 Murakami, K. and Mizushima, U.
(Studies on the physiology of artificial polyploids. I. Changes in the content of total nitrogen and total sugar during the process of growth of tetraploid buckwheat).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 76–80. [Japanese].

Although tetraploid buckwheat seeds are larger than the diploid, subsequent growth is slower so that eventually the diploids overtake the tetraploids. The relative contents of total nitrogen of the diploid and tetraploid strains were inversely related to superiority in size. The tetraploid seeds had less sugar than the diploid, but the sugar content of the tetraploids was greater after the cotyledons had unfolded; thereafter, the sugar content of the tetraploids again dropped below the diploid level.

259 Solovjev, G. M.
(The importance of heterostyly in the hybridization of buckwheat).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 4 : 17–28. [Russian].

Fertilization processes in buckwheat are discussed with reference to heterostyly, self pollination and cross pollination. The writer concludes that fertilization may occur (*a*) in crosses between long style x short, and short x long, (*b*) in crosses between long style x long and short x short, (*c*) in plants pollinated with self pollen, and (*d*) in material pollinated with the pollen from the same floret.

260 Elagin, I. N.
(The production of hybrid buckwheat seed).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 6–10. [Russian].

The method of producing heterotic seed on a collective farm in the Tula province involved direct and reciprocal intervarietal crosses between long-style and short-style individuals and supplementary pollination by Musiĭko's method. It was found that the progeny of long-style x short-style was normally more productive than that from the reciprocal cross. Hybrid seed was obtained too from crosses between Bogatyrj [Hero] and Kazanskaja

[Kazanj] and between Bolshevik and Kazanskaja.

On another farm, in the Moscow province, heterotic seed was obtained by open pollinating long-style types of Bogatyrj with 25 other varieties planted in adjacent rows, including Tetraploidnaja Saharova [Saharov's Tetraploid].

261 TSVETOUKHINE, V.
Le sarrasin et ses possibilités d'amélioration. (**Buckwheat and its possibilities with regard to breeding**).
Ann. Inst. Nat. Rech. Agron., Paris 1952 : **2** : 99–115.

Notes on the origin of buckwheat (*Fagopyrum* spp.) and its botanical characteristics and classification are followed by a study of the cultivated species and a description of the main types.

Results are given of self and cross pollination of long and short style plants. An experiment showed that mass selection for different types of seeds in a heterogeneous population could be effective.

Crosses within the group *F. esculentum*, including *F. emarginatum*, are thought to be frequent, but the possibility of hybridization between *F. tataricum* and *F. stenocarpa* seems unlikely. In the writer's opinion, crossing between the two groups *F. esculentum* and *F. emarginatum* on the one hand, and *F. tataricum* and *F. stenocarpa* on the other, does not occur, judging from the fact that no seed intermediate in type between these two groups was formed.

Rejecting the notion that distinct varieties of buckwheat exist, owing to the prevalence of cross pollination and the absence of any work on selection, the writer concludes with a description of what he terms the principal types, all of which have $2n = 16$ as their chromosome number.

OATS

262 KELLY, A. F.
A description of the recommended varieties of oats.
J. Nat. Inst. Agric. Bot. 1951 : **6** : 5–19.

Characters used in distinguishing varieties of oats are discussed and detailed descriptions and photographs are given of spring and autumn varieties recommended for different parts of the United Kingdom.

263 Jokioisten Juha-kaura. (**The Juha oat from Jokioinen**).
Maatalous Koetoiminta 1952 : **6** : Pp. 12.

Results are given of trials over an eleven year period with the newly released oat variety Juha, derived from a cross between the Finnish variety Esa and the Swedish Stjärn [Star]. Experimental data are given in which Juha and other, principally Finnish, varieties are compared with the Swedish variety Kultasade II [Golden Rain II]. The variety under trial has shown itself superior to the latter in both grain yield and straw quality and can be successfully cultivated on a wide range even of poor soils in the southern parts of Finland.

264 NISHIYAMA, I.
(**Production of amphidiploids of pentaploid oat hybrids**).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 91–94. [Japanese].

Putative allodecaploids have been obtained by colchicine treatment of *Avena barbata* ($2n = 28$) x *A. nuda* ($2n = 22$) and *A. barbata* x *A. sativa* ($2n = 42$).

265 HADDEN, S. J.
Unusual success in crossing oats.
Agron. J. 1952 : **44** : 452–53.

A crossing technique by which 69·5% seed were set at Yamassee, SC, is described in detail. Since natural pollination was found to occur most frequently about 3.30 p.m., emasculation was undertaken in the late morning or early afternoon and artificial pollination was begun just before the time of normal anthesis on the same day and rapidly completed while pollen from normally dehiscing anthers was available. It is thought that by delaying emasculation until very shortly before the time of normal anthesis the flowers are less easily injured because they are more fully developed. As a control, some flowers pollinated on the day following emasculation produced only 2·7% seed.

266 POHJAKALLIO, O.
Jyvän suuruuden merkityksestä kauralajikkeen suurimokelpoisuutta arvostelta essa. (**The importance of the grain size of oat varieties for estimating their suitability as hulled grain**).
Maataloust. Aikakausk. 1940 : **12** : 89–97.

The following data are given for Finnish and foreign oat varieties: grain size and weight, husk percentage and proportion of double grains. The relation of these characters to the quality of the hulled product is elucidated.

267 COLLISTER, E. H. and KRAMER, H. H.
The effect of oat variety on the stand and development of red clover.
Agron. J. 1952 : **44** : p. 385.

Analyses of stand and total clover yield of *Trifolium pratense* grown at the Purdue

University Soils and Crops Farm, Lafayette, Ind., in combination with seven different oat varieties show that the oats Clinton and Benton caused a significant reduction in the number of clover plants and also suppressed individual plant development.

268 POHJAKALLIO, O.
Kauran nokitaudin ilmenemisestä erilaisissa valoisuussuhteissa. (**Manifestation of smut disease in oats under different conditions of illumination**).
Maataloust. Aikakausk. 1952 : **24** : 24–29.

Data are given for four oat varieties on the effects of varying intensity of illumination, both continuous and intermittent, on development, on dry weight and on incidence of infection by *Ustilago Avenae.*

269 PENDLETON, J. W., BEVER, W. M., BONNETT, O. T., MCKIBBEN, G. E. and JOHNSON, P. E.
Spring oats for Illinois.
Circ. Ill. Agric. Exp. Sta. 1951 : No. 697 : Pp. 8.

On the basis of their performance for at least three years in trials at four centres, varieties are recommended for different regions. Tabulated data also include a list showing the reactions of numerous varieties and experimental hybrids to crown rust race 45, which has recently become widespread.

270 WATERHOUSE, W. L.
Crown rust of oats.
Aust. Plant Dis. Recorder 1952 : **4** : p. 29. (Mimeographed).

A race of *Puccinia coronata* isolated at Dundas, NSW, has attacked Klein 69B, a variety previously resistant to all known races. Victory x Richland has also proved susceptible to another isolate from Lawes, Qd. Both varieties have been used extensively in breeding programmes, which are therefore seriously affected.

271 **New oats variety developed.**
Canad. Grain J. 1952 : **8** : No. 1 : p. 10.

Torch, a new hull-less oat developed at the University of Saskatchewan, is recommended to local farmers for forage and fodder purposes in place of Brighton; it possesses a higher degree of stem rust resistance than the latter, and is also resistant to loose smut and covered smut. The straw of the new variety is moderately long and strong; its grain is slightly smaller than that of Brighton but its bushel weight is higher.

272 DORFSCHMID, M.
Untersuchungen an Hafer über den Befall durch die Fritfliege (*Oscinella frit* L.). [**Investigations on oats concerning attack by frit fly (*O. frit* L.)**].
Z. Acker- u. PflBau. 1952 : **95** : 183–218.

The various factors affecting frit fly attack are analysed in some detail. Reference to the pedigree of the resistant variety Hohenheimer V is made to prove the existence of hereditary resistance. Microscopic investigations, carried out on leaves of thirteen oat varieties, revealed no anatomical differences but clear differences in the cellulose-pectin deposits in the epidermis, as determined by the iodine-zinc chloride reaction in the first leaves. Resistant and semi-resistant varieties showed a strong reaction, which diminished progressively with increasing susceptibility. Classification of the varieties on this basis corresponded exactly with their behaviour in the field. The differences were less pronounced after the third leaf stage, when cellulose and pectin were developed in all varieties and it is significant that this corresponds also to the critical stage after which the larvae do not attack the plant. After the fifth leaf no differences were detectable. Determinations of sugar content indicated a certain correlation between the sucrose content of the seed and frit fly resistance; the effect is apparently an indirect one, the higher sugar content enabling the plants to pass the critical stage more rapidly. The sugar content varies however within a variety and is therefore not in itself a reliable criterion of resistance.

273 MULTAMÄKI, K.
Kauran lajikekokeiden tuloksia Jokioisissa. (**Some results of oat variety trials at Jokioinen**).
Koetoiminta Käytäntä 1949 : No. 16 : Pp. 3.

An account of trials carried out between 1941–48 is given in which four varieties, Swedish and Finnish in origin, are compared with Kultasade II [Golden Rain II] in respect of yield, length of growing period and characteristics of the grain and straw. An account of the suitability of these varieties for cultivation in different parts of Finland is included.

274 HERNES, O.
Sortforsøk med havre i Hedmark og Oppland. (**Variety trials with oats in Hedmark and Oppland**).
Forsk. Fors. Landbr. 1951 : **2** : 355–68.

Trials carried out during 1934–50 at the Møystad Experiment Station and in various localities in the central part of eastern Norway included Norwegian, Swedish and Finnish varieties. The Svalöf oats Sol II [Sun II] and Örn [Eagle] gave the best yield of grain; both have very stiff straw, but Sol II was superior in quality and earliness. The highest yielding among the earlier varieties was Kytö, but the quality was not so good, whereas Bambu, though not so high yielding, was superior in quality and had very stiff straw. The Vidarshof variety Hein II is recommended among the very early oats for its combination of earliness, good quality of grain and quite high yield.

275 SHANDS, H. L. and ARNY, D. C.
Oats.
Circ. Wis. Agric. Exp. Sta. 1952 : No. 418 : Pp. 18.

A general survey is given of the aims of current breeding work and the varietal testing programme undertaken by the Wisconsin Agricultural Experiment Station in cooperation with the US Department of Agriculture. Desirable characteristics of valuable breeding stocks are indicated, and several recently developed varieties, including Branch, Craig and Lanark (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts. 308, 318 and 997) are briefly described.

RYE

276 HAGBERG, A.
Heterosis in some crosses between populations of rye and red clover.
Hereditas, Lund 1952 : **38** : 506–10. (Abst.).

Details are given of crosses between three varieties of spring rye obtained from breeding stocks maintained at Svalöf and Landskrona, Sweden. Grain yields in the F_1 of Petkus x Od and Giant x Od exceeded those of the higher yielding parents, Petkus and Giant, by 12 and 17% respectively, thus exhibiting a heterotic effect which is correlated with the genetical difference between Od and the other varieties. The F_1 of Giant x Petkus yielded only 2% more than the better parent. Although Giant and Petkus were obtained from different stations, many similarities between these varieties suggest that they are very closely related, a fact which accounts for the absence of heterosis in their F_1 progeny.

Analyses of crosses between eight Swedish strains of red clover failed to provide evidence of heterosis. It is therefore assumed that genetical variation within each clover strain is greater, in comparison with differentiation between populations, than in the rye varieties studied.

277 KLEČKA, A.
Žitný klas s obilkami ovsahy. **(A rye ear bearing wild oat seeds).**
Sborn. Čsl. Acad. Zeměd. 1952 : **25** : 153–62.

A rye ear bearing a few seeds of *Avena fatua* was found at Chrášťany. This is regarded as evidence in support of Lysenko's theory of the conversion of one species into another.

278 LIMA-DE-FARIA, A.
Chromomere analysis of the chromosome complement of rye.
Chromosoma, Berlin 1952 : **5** : 1–68.

Pachytene configurations investigated at the Institute of Genetics, Lund, are described and details are given of the number, size and sequence of chromomeres on the seven A chromosomes and the standard fragment (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts. 1848 and 2622). The chromomeric structure of kinetochores and knobs is similar in each of the A chromosomes and the fragment; the series of chromomeres constituting knob formations are however much larger than elsewhere on the chromosome and are held together more closely by deeply stained fibrillae, so that they appear to coalesce, forming a continuous chromomeric mass. Numerous chromomeres have the usual round shape but possess a hairy structure reminiscent of the constituent elements of lampbrush chromosomes. Since the term lampbrush can only be applied to a whole chromosome, single chromomeres with this appearance are designated hairy chromosomes; these are most frequently found in the heteropycnotic regions of the chromosome where chromomeres are relatively large.

Homologous chromomere pairs of unequal size or chromomeres without homologous partners are of irregular occurrence on all chromosomes. In addition to this variability a constant form of structural heterozygosity occurs on chromosome IV, where two chromomeres have partners of unequal size. Duplications and deficiencies, giving rise to heterozygous gametes, appear in innumerable combinations as a consequence of cross pollination; thus permanent genetic heterozygosity is inevitable. It is also pointed out that such heterozygosity may be responsible for the nonviability of a certain percentage of pollen and for the subsequent sterility which has been observed.

279 MÜNTZING, A. and TEDIN, O.
Svalöfs dubbelråg. Ett nytt rågmaterial med värdefulla kärnegenskaper. (**Svalöf double rye. New rye material with valuable grain characteristics**).
Svalöf Katalog för Hösten 1951. Allm. Svenska UtsädesAB, Svalöf 1951 : 4–6.

The new tetraploid rye Dubbel Stål [Double Steel], bred by the Swedish Seed Association from the variety Stål (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1804 and Vol. XXIII, Abst. 167) is described.

280 DEUFEL, J.
Die Züchtung von Mutterkorn (*Claviceps purpurea*) auf tetraploidem Roggen. [**Growing ergot (*C. purpurea*) on tetraploid rye**].
Naturwissenschaften 1952 : **39** : p. 432.

The sclerotia of *C. purpurea* that developed on tetraploid Petkus rye after artificial infection were larger and weighed on the average three times as much as those from diploid rye, some being as much as five times as heavy.

281 DEUFEL, J.
Der Alkaloidgehalt von auf tetraploidem Roggen gewachsenen Mutterkornsklerotien. (**The alkaloid content of ergot sclerotia grown on tetraploid rye**).
Naturwissenshaften 1952 : **39** : 432–33.

The sclerotia of *Claviceps purpurea* grown on tetraploid rye (cf. Abst. 280) contained a larger number of cells than those from diploid rye, the cell size itself being no greater. The alkaloid content of the sclerotia from tetraploid rye was 0·035% as compared with 0·028% in those from the diploid.

282 KAPLUNOVSKIĬ, S.
(**Perennial rye—a valuable forage plant**).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 6 : p. 58. [Russian].

A productive and hardy perennial rye grown for forage has been bred by Mičurinite methods at the Stavropolj Experimental Field Station. The crosses made involved Eliseevskaja, Bezenčukskaja [Bezenčuk], Vjatka and Taraščanskaja as the female varieties and two wild perennial rye species originating from the northern Caucasus and Armenia as the male parents. Variety 133, which was selected from the hybrid material and has the perennial habit, gave a good account of itself in the trials.

MAIZE

283 WARNER, J. N.
A method for estimating heritability.
Agron. J. 1952 : **44** : 427–30.

Estimates of heritability of kernel row number, number of kernels per row, total number of kernels, diameter of ear and cob, ear length, kernel length and weight, kernel yield and date of silking were made from the F_2 and back crosses of the F_1 to each of the two maize inbreds, A 158 and W 9. Heritability was calculated as $\frac{(\frac{1}{2})D}{V_{F_2}}$ where $(\frac{1}{2})D$ = the additive genetic component of variance of the F_2 and V_{F_2} = total variance with the F_2, and $(\frac{1}{2})D = 2(V_{F_2}) - (V_{B_1} + V_{B_2})$ where V_{B_1} and V_{B_2} are the total variance within back crosses of the F_1 to the respective parents. The estimation of nonheritable variance is unnecessary, using this method.

284 KRICKL, M.
Eine praktisch erprobte Beobachtungs-, Aufarbeitungs- und Analysenmethode zur Auslese der geeigneten Pflanzen für die Maiszüchtung. (**A method of observation, handling and analysis tested in practice for selecting suitable plants in maize breeding**).
Z. Pflanzenz. 1952 : **31** : 339–58.

Details are given of the five-point scale used in recording such characters as standing capacity, disease resistance and tillering, of the colour charts used in recording shades of pigmentation, of the observations made on the mature plant, the numbering and treatment of élites, and of the sowing and cultivation techniques in the breeding plots. One of the most important criteria for selection in Austria is time of maturity, as the latest varieties do not ripen fully in bad years; a reduction of several days in vegetation period can be effected in the late varieties by selection. Row number is also an important character and the ear type found in many land varieties, where there are ten rows at the base and eight further up the ear, is thought to have some advantages, since under optimum conditions it produces 10 rows almost all the way. Long grains are, other things being equal, preferred to short; in addition to grain yield, the oil and protein content, and for sweet corn also sugar content, are determined, and the methods used for estimating these on small quantities of seed are briefly described.

285 NALDI, L.
Insubria 133. Insubria 524. (**Insubria 133 and Insubria 524**).
Ital. Agric. 1952 : **89** : 550–53.

The pedigrees and ancestral characters are given of these two new hybrid maizes (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1817), produced in 1951 by the Experimental Station for Maize Culture, Bergamo. Insubria 133 (Wisconsin 641 AA) comes from the double cross (Wf 9 x M 14) x (W 32 x W 187), while Insubria 524 (Wisconsin 355) was obtained from (W 9 x WM 13) x (W 25 x W 153). The latter is particularly early and ripens in 105–108 days. Both varieties are suited to certain dry parts of Italy, and Insubria 524 is also recommended for some hilly districts and for use as a maize grown for two crops as a substitute for the so-called 40-day and 50-day wheats.

In conclusion a table is given showing the six hybrids released by the Bergamo Station since 1948, their grain characters, vegetative period and, in the case of five varieties, their American designation as well as their Italian classification by type.

286 ALPATJEV, A. V.
(Growing sweet corn in the central belt of the RSFSR).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 5 : 43–45. [Russian].

Several varieties adapted to cultivation in central Russia, including Pionerka Severa 06 [Pioneer of the North 06] and Rannjaja Želtaja 023 [Early Yellow 023], which were bred at the Gribovo Breeding Station, are listed.

Pionerka Severa 06 is early and produces pinkish-white kernels. The plant is sturdy and bears 3–5 medium large ears. However, under Moscow conditions only 1–2 reach maturity.

Rannjaja Želtaja 023 is earlier than Pionerka Severa 06, but it is less productive and its kernels have an inferior flavour.

Of the hybrids, those involving Pionerka Severa, Rannjaja Žemčužina [Early Pearl] and Maĭskaja [May] or Rannjaja Želtaja, Zolotoĭ Leonarda [Leonard's Golden] and Zolotoĭ Bentama [Golden Bantam] are regarded as productive under the conditions of Central Russia.

287 ARNOLD, C. R. F.
Maize in South Africa.
Brit. Agic. Bull. 1952 : **5** : 151–54.

A general survey mentions the progress being made in breeding hybrid maize to suit different local conditions.

288 JENKINS, M. T.
Pedigrees of southern experimental hybrids. Indexed list number 3.
US Dep. Agric., Agric. Res. Admin., Bur. Pl. Indust., Soils Agric. Engin., Div. Cereal Crops Dis. Beltsville, Md. 1951 : Pp. 94.

Lists are given of (1) the inbred lines of maize used as parents of experimental hybrids in the southern states, and (2) experimental double hybrids and their pedigrees. Only hybrids involving inbreds with permanent designations have been included.

289 WIIDAKAS, W.
Corn hybrids suitable for North Dakota.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1952 : **14** : 151–56.

On the basis of trials carried out since 1944, maize hybrids are recommended for the six different maturity zones.

290 BOCANEGRA SALAZAR, S.
Comparativo de híbridos y variedades de maíz en la Costa Central del Perú. (**Comparison of maize hybrids and varieties in the central coastal region of Peru**).
Agronomía, Lima 1952 : **17** : No. 70 : 72–75.

The main types of maize grown in the area are described, and also a number of hybrids produced by Peruvian geneticists. In tests in various localities the hybrid Nicholson Giant Yellow Dent x Colombiano Fumagalli has done well throughout and given yields 25% in excess of those from local varieties.

291 LANZA, F.
Prove orientative con mais ibridi americani e varietà italiane. Fattori di fertilizzazione e produttività. (**Preliminary experiments with American hybrid maizes and Italian varieties. Manuring factors and productivity**).
Ann. Staz. Chim.-Agr. Roma 1951 : Pubbl. 54 : Ser. III : Pp. 10.

The effects are recorded of variation in the supply of water and chemical manures upon the performance of five American dent hybrids and three open pollinated Italian varieties. The variety Ohio M. 15 seemed to be the best adapted to arid conditions.

292 Lanza, F.
Osservazioni sul sistema radicale in *Zea mays indentata* (ibrido "U 32") e in *Z. mays indurata* (varietà "Nostrano dell'Isola Alto"). **[Observations on the root system in *Z. mays indentata* (hybrid U 32) and in *Z. mays indurata* (Nostrano dell'Isola Alto variety)].**
Ann. Sper. Agr. 1952 : **6** : 941–51; also Ann. Staz. Chim-Agr. Roma 1951 : Ser. III : Pubbl. 68 : Pp. 9.

Contrary to popular belief, the root system of the hybrid was not heavier or longer, in spite of the greater development of the aerial portions of the hybrid. It follows that the hybrid, though more efficient under favourable growth conditions, is more susceptible to deficiency of nutrients or of humidity.

293 Fleming, A. A.
Field plot technique with hybrid corn under Alabama conditions.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 53.

In experiments on suitable field plot techniques for testing 16 to 36 maize hybrids, plots varying in width from 3·5 to 10·5 ft. and in length from 17·5 to 26·25 ft. proved the most efficient. Material decreases in efficiency occurred when the length increased beyond 35 ft. for a 1-row plot and beyond 26·25 ft. for 2-row and 3-row plots. Four or five replications of a 2 x 15-hill plot were satisfactory, using 24 entries. With 16, 25 and 36 entries the relative efficiency of the simple lattice increased slightly over that of the randomized complete block design as plot size and number of entries increased.

294 Robinson, J. L. and Hutchcroft, C. D.
The 1951 Iowa corn yield test.
Bull. Ia Agric. Exp. Sta. 1952 : No. P. 112 : 759–812.

Tabulated data concerning the performance of maize hybrids at 12 trial centres are presented, with a short list of outstanding hybrids for northern, central and southern areas.

295 Rogers, J. S. and Collier, J. W.
Corn production in Texas.
Bull. Tex. Agric. Exp. Sta. 1952 : No. 746 : Pp. 74.

Sections are included on the crossing techniques involved in hybrid maize production and the progress of the local breeding programme, with tabulated descriptions of the more important inbred lines used for hybridization and of double cross hybrids released since 1941. Hybrids are recommended for particular areas.

296 Bianchi, A.
Andamento della germinazione in campo di due razze di granoturco e loro incroci reciproci. **(The course of germination in the field of two varieties of maize and their reciprocal crosses).**
Sci. Genet. 1951 : **4** : 61–72.

The variety Marano Vicentino germinates earlier than Nostrano dell'Isola, and the reciprocal hybrids between them are earlier than the maternal parents, apparently owing to heterosis. Sowing on different dates in April did not reveal any appreciable difference in the germination time of either of the parents, but the hybrids were adversely affected by late sowing.

297 Kozelnicky, G. M.
The performance of corn inbreds per se in comparison with their performance in test-cross combination.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 53–54.

Correlations between inbred lines and their test cross progenies were highly significant for resistance to lodging, resistance to *Helminthosporium turcicum*, ear height and plant height. Correlations between plant weight of the inbreds and grain yield of the corresponding test crosses were not significant; plant weight of the inbreds was used instead of grain yield because adverse weather resulted in failure of seed set.

298 Laughnan, J. R.
The action of allelic forms of the gene *A* in maize. IV. On the compound nature of A^b and the occurrence and action of its A^d derivatives.
Genetics 1952 : **37** : 375–95.

It was inferred from previous investigations (cf. *Plant Breeding Abstracts*, Vol. XIX, Absts 956 and 2539) that the A^d mutant represents the α component of A^b separated from the β component by crossing-over. Recent research, involving the use of the marker genes *sh*, *lg* and *et*, has shown, however, that a small proportion of A^d mutants originate by some mechanism other than crossing-over, possibly by unequal exchange of sister chromatids, mutation of the β component or loss of the latter. All A^d mutants are dominant for brown pericarp, are competitive in compounds with A^{br} and fail to give a cumulative response with increasing doses, regardless of their origin. Three A^d mutants resulting from crossing-over showed a high rate of reversion, typical of *a*, in the presence of *Dt*, while 50 others of varied origin remained stable. It is assumed that the

mutable form of A^d has two components, namely, α and the recessive *a*. The presence of the latter in conjunction with α is attributed to variation in the mode of synapsis preceding crossing-over in A^b/a individuals.
The significance which data on closely linked genes with similar effects have for concepts of gene mutation is discussed.

299 LONGLEY, A. E.
Chromosome morphology in maize and its relatives.
Bot. Rev. 1952 : **18** : 399–412.

Literature of the past decade is reviewed, with special reference to: (*a*) distribution of chromosome knobs in varieties of maize and in species of *Tripsacum* and *Euchlaena*, and its bearing on intergeneric relationships and the possible centre of origin of cultivated maize; and (*b*) determination of the location and interaction of numerous genes by analyses of chromosomal aberrations.

300 NISHIMURA, Y.
(The *Oenothera* method in plant breeding).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : p. 90. [Japanese].

A brief account is given of the multiple translocation breeding technique devised by Burnham (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 191).

301 HUELSEN, W. A.
A pedigree system for plant breeders.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 463–70.

The system devised for recording pedigrees of sweet corn hybrids at the University of Illinois is described in detail. Its flexibility enables it to be adapted to any complex breeding programme.

302 SCHWARTZ, D.
The effect of oxygen concentration on X-ray-induced chromosome breakage in maize.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 490–94.

Using two closely linked genes determining aleurone colour (*A*) and shrunken endosperm (*Sh*) as markers, chromosomes of maize pollen were shown to be more sensitive to X irradiation in air than in 100% nitrogen. The differential protection of low oxygen tension with respect to interstitial and terminal deletions suggests that oxygen influences the fusion of broken ends rather than the initial breakage mechanism. Since an alteration in oxygen tension after irradiation does not affect the frequency of chromosomal aberrations (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 2087), it is assumed that there is some qualitative difference between broken chromosome ends, depending on the amount of oxygen present at the time of breakage. Chromosomes broken in an atmosphere of nitrogen rejoin more easily than those broken in the presence of oxygen.

303 ALEXANDER, D. E.
Relation of environment and position of ear to kernel row number in corn.
Agron. J. 1952 : **44** : 430–33.

At the Illinois Agricultural Experiment Station the inbreds Iowa L 289, Indiana WF 9 and Illinois 90 and their three single crosses, L 289 x WF 9, L 289 x 90 and WF 9 x 90, were cut back six times above the growing point soon after seedling emergence at intervals of 3–4 days in 1948 and 1949. Subsequent analyses of the number of kernel rows on ears produced at each of five nodes have shown that hybrids were less affected by the adverse conditions during early growth stages than the inbreds; in the latter, cutting back effectively reduced the number of kernel rows.

304 ROBERTSON, D. S.
The genotype of the endosperm and embryo as it influences vivipary in maize.
Proc. Nat. Acad. Sci., Wash. 1952 : **38** : 580–83.

By using stocks with an A–B translocation, TB–1b, in combination with viviparous-5, a mutant which inhibits carotenoid and chlorophyll development as well as inducing premature germination while still in the ear, it has been possible to distinguish between the relative influence of the genotypes of the endosperm and embryo. Data suggest that the endosperm does not play an active role in vivipary, since seeds with either normal or mutant endosperm germinate prematurely if the embryo is genetically viviparous. The evidence from heterofertilizations, in which the egg and polar nuclei fuse with male nuclei from different microspores, also supports the assumption that the genotype of the embryo determines whether dormancy should occur.

305 CAPINPIN, J. M. and SILVA, V. B.
The influence of hybridization on the protein content of maize.
Philipp. Agric. 1951 : **35** : 86–89.

Lagkit and Native Yellow Flint, two Philippine varieties with high and medium protein content respectively, and Cuban Yellow Flint, an introduction with a low protein percentage, were crossed in all possible combinations at Los Baños, Laguna. All F_1 hybrids gave increased yields. The protein content of F_1 hybrids between parents with high and medium protein content was higher than either parent or the average of both parents, indicating the heterotic effect of hybridization on this character. When Cuban Yellow Flint was used as the female parent, similar increases in protein content were observed in F_1 progenies, but the protein content of the F_1 was lowered when this variety was used as the male parent.

306 Hédin, L. and Lefèbvre, J. -M.
Recherches sur la caractérisation chimique d'espèces ou de variétés de plantes fourragères et prairiales. 1er mémoire. (**Investigations on the chemical features of species or varieties of forage and meadow plants. 1st Report**).
Ann. Inst. Nat. Rech. Agron., Paris 1952 : **2** : 55–98.

The chemical composition and metabolism of different types of maize and some populations of cocksfoot and of timothy were studied by the leaf sample method to discover whether any relations exist between mineral content and biological phenomena such as earliness, winter or spring habit, or cold resistance.

Though mention is made of preliminary attempts to compare chemical composition (1) in relation to varietal differences and (2) in parents and their progeny from selfing or cross pollination, the report is mainly concerned with the chemical analysis, and, in particular, the validity of the technique of foliar diagnosis used.

It seems possible that maize varieties and populations of cocksfoot and of timothy can be distinguished by determining their content of mineral compounds.

307 Morris, R.
Transmitted pollen and chromosomal aberrancies induced in maize by tassel exposure in a nuclear reactor.
Amer. J. Bot. 1952 : **39** : 452–57.

Mature tassels were exposed to thermal neutrons in a nuclear reactor for 0, 1, 2, 4 and 8 minutes; their pollen was then used to fertilize untreated plants. Resulting F_1 individuals which had abnormal pollen, i.e. subnormal grains with respect to size and starch content, were outcrossed as male parents to lines with a high degree of cytological normality. About half of the F_1 outcross progenies segregated for abnormal pollen. Most of the original F_1 plants fell within the range of 75–100% abnormal pollen; in the F_1 outcrosses most plants were distributed in classes below 75%, with a tendency towards groupings within the ranges 10–24% and 45–54%. Among the 123 F_1 outcross progenies segregating for abnormal pollen, 111 carried one or more chromosomal aberrations, which chiefly consisted of translocations involving two chromosomes; the remaining 12 had no detectable irregularities. The 230 measurable chromosomal breaks gave a statistically random distribution among chromosomes, chromosome arms and sections of arms.

308 Capinpin, J. M. and Alonzo, J. C.
An experimental study of odd-rowed maize ears.
Philipp. Agric. 1951 : **35** : 32–36.

When seeds from self-pollinated College Yellow Flint ears bearing 11, 13 or 15 kernel rows were grown at the College of Agriculture, Laguna, Philippines, with controls from normal even-rowed ears, the majority of plants produced ears with an even number of kernel rows. Among 686 ears of odd-rowed origin only five ears with 11, 13 or 15 rows were produced, but each of these five had the same number of rows as its parent. The occurrence of odd-rowed ears was of such a low frequency that it could not, however, be attributed to the inheritance of factors determining the development of an odd number of kernel rows.

309 Teas, H. J., Cameron, J. W. and Newton, A. C.
Tryptophan, niacin, indoleacetic acid, and carbohydrates in developing sugary and starchy maize kernels.
Agron. J. 1952 : **44** : 434–38.

Two genetically distinct lines, KYS and R 4, each producing both sugary (su_1) and starchy (Su_1) kernels were used to determine quantitative relationships between tryptophane, niacin, indoleacetic acid and carbohydrates during kernel development. Significant agreement was found between both lines. At early stages the kernel composition of both genotypes was similar, but as development progressed kernels of su_1 genotype showed a higher content of all four substances than starchy kernels of the same genetic background. At maturity the indoleacetic acid content of both genotypes was similar, but the relative proportions of all the other substances remained constant in both genotypes.

310 CARLES, J., SOUBIÈS, L., GADET, R. and MAURY, P.
L'hétérosis du maïs hybride. (Heterosis in hybrid maize).
CR Acad. Sci. Paris 1952 : **234** : 979–81.

A comparison between the double hybrid Wisconsin 416, its parental single crosses and the grandparental pure lines, all grown in France, has shown that the marked heterosis in yield of the hybrids is accompanied by a significant decline in protein content.

311 SPRAGUE, G. F., MILLER, P. A. and BRIMHALL, B.
Additional studies of the relative effectiveness of two systems of selection for oil content of the corn kernel.
Agron. J. 1952 : **44** : 329–31.

Methods of recurrent selection and selection within selfed lines were compared with respect to their efficiency in increasing the oil content of maize at the Iowa Agricultural Experiment Station. In the selfed series, the mean oil percentage was increased from 4·97 to 5·62 during five generations, showing an average increase of 0·13% per year, whereas in the recurrent series the increase was from 4·97 to 7·0% over an equivalent period, giving an average yearly increase of 0·41%. Since the recurrent series was much more variable in phenotype and oil percentage than the inbred series, it is obvious that the calculated efficiency of recurrent selection is minimized by disregarding differences in residual genetic variability; nevertheless, this method was most effective. It has been suggested that at least one generation of random mating after intercrossing might further improve the efficiency of recurrent selection by tending to conserve genetic variability.

312 ABBASI, F. H.
Hybrid maize—an asset in the food production drive.
Indian J. Genet. 1951 : **11** : 185–95.

A preliminary account of the methods of breeding hybrid maize is followed by a survey of work undertaken at the Indian Agricultural Research Institute where a number of inbred lines, evolved from both indigenous and adaptable foreign varieties, are showing promise in combining ability tests (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1708), and cytogenetical investigations of a wide range of material from all parts of India are in progress. In addition to adaptability trials of newly developed inbreds, many foreign inbreds and hybrids, introduced with the aid of FAO, are being tested for immediate use in different regions. Although some of the hybrid introductions have already outyielded local open-pollinated maize, it is feared that many of the inbreds from which they are derived are not adaptable to local conditions; thus local production of foreign hybrids may not after all be possible.

313 BECKER, W. R.
Hybrid maize in Holland.
World Crops 1952 : **4** : 304–07.

An account is given of the successful local production of inbred lines and hybrid seed from American material supplied by FAO. Although these hybrids have yielded well, they have recently been outyielded by earlier maturing hybrids, such as Goudster and Amtwee, bred for local conditions.

314 RANDOLPH, L. F.
New evidence on the origin of maize.
Amer. Nat. 1952 : **86** : 193–202.

From information concerning the present centre of diversity of the American Maydeae, the cytological characteristics of this group, the crossability of existing types of maize and *Tripsacum* in Mexico and Guatemala, and archeological findings, the following hypothesis of the origin of cultivated maize is formulated. The domestication of maize occurred 5000–10,000 years ago, probably in Mexico or the southwestern United States, where it formed one of the first food plants cultivated by the more settled ancestors of the nomadic tribes that originally spread southward. The progenitor of cultivated maize is assumed to be intermediate in most characteristics between the maize of the Bat Cave era (cf. *Plant Breeding Abstracts*, Vol. XIX, Absts 2554 and 2556) and its closest relatives *Euchlaena* and *Tripsacum*. Substantial progress in the solution of the problem of the origin of cultivated maize may be expected from further archeological and botanical studies of unexplored areas of Mexico and the southwestern United States.

315 INGERSOLL, F. S.
Male sterile corn makes better hybrids.
Crops & Soils 1952 : **4** : No. **9** : 26–27.

The purity of commercial maize hybrids has improved with the use of cytoplasmically male sterile lines for seed production. Since the male inflorescences need not be removed, damage caused by this operation is avoided and seed yields are consequently increased. Seed released to growers must, however, contain a pollen restoring factor, or consist of a mixture of male sterile and male fertile seed from the same lines.

316 HOOKER, A. L. and DICKSON, J. G.
Resistance to *Pythium* manifest by excised corn embryos at low temperatures.
Agron. J. 1952 : **44** : 443–47.

Following germination at 12° C for 0–15 days, or at 24° C for 0–72 hours, excised embryos of two susceptible maize inbreds, W 16 and W 28, two resistant inbreds, M 14 and W 23, and the 12 possible single cross hybrids were inoculated with *P. Debaryanum* by placing on a 2-day culture of the pathogen for 4 days. Although reaction to the pathogen varied with different hybrids, all embryos became progressively more resistant with increasing age. High temperature accelerated development of resistance. The increase in degree of resistance was more rapid in resistant inbreds than in susceptible inbreds. A high correlation was observed between the reaction of single cross embryos and the average reaction of the inbred parents. In general, differences between reciprocal hybrids were small, but the embryonic reaction was frequently modified by the female parent, suggesting a nutritional relationship. It appears that the same basic mechanism determines reaction in both inbreds and hybrids, but a slight heterotic effect in the latter is expressed by development of resistance at an early stage of germination. This may account for the commonly recorded observation that inbreds are more susceptible than hybrids at low temperatures.

317 ISELY, D.
The cold test for corn.
Proc. Int. Seed Test. Ass. 1950 (1951) : **16** : 299–311.

Methods, which have proved satisfactory in the USA, for determining the reaction of hybrid maize seed to low temperatures are described; standardization of techniques is advocated before such methods are widely used for evaluating hybrids.

318 WERNHAM, C. C.
Disease resistance and early testing in maize.
Science 1952 : **116** : 57–58.

The author advocates testing for disease resistance at an early stage in breeding, referring particularly to resistance to *Helminthosporium turcicum.* The common practice of carrying out a second top cross at a later date is regarded as redundant.

319 JENKINS, M. T., ROBERT, A. L. and FINDLEY, W. R. (JUN.).
Inheritance of resistance to *Helminthosporium turcicum* leaf blight in populations of F_3 progenies.
Agron. J. 1952 : **44** : 438–42.

Further evidence for a complex genetic mechanism controlling blight resistance was obtained from analyses of 12 groups of F_3 maize hybrids, previously studied in the F_1, F_2 and back cross generations (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2679). Most of the genes influencing reaction to blight have minor effects, but some lines carry major genes for resistance or susceptibility. Frequency distributions for leaf blight incidence in the F_3 of 38–11 x NC 34 and R 4 x L 97 indicate the presence of major genes for resistance operating under conditions of only slight infection; similar data from R 4 x T 528 and R 4 x CI 23 progenies give evidence of major genes for susceptibility, which operate under epidemic conditions. Other genes producing major effects over a wide range of disease incidence are apparent from the analyses of F_3 progenies of K 64 x NC 34 and 38–11 x L 97.

320 ULLSTRUP, A. J.
Leaf blights of corn.
Sta. Bull. Purdue Agric. Exp. Sta. 1952 : No. 572 : Pp. 22.

A general survey of the leaf diseases of maize caused by *Helminthosporium turcicum*, *H. Maydis*, *H. carbonum*, *Bacterium stewartii* and *Pseudomonas alboprecipitans* provides information on inbreds with some degree of resistance and on the inheritance of resistance or susceptibility to each of the diseases. Methods of inoculation which have proved successful for determining disease reactions at Lafayette, Ind., are appended.

321 DICKE, F. F., and PENNY, L. H.
Built-in resistance helps corn fight borers.
Crops & Soils 1952 : **4** : No. 9 : 9–11.

The progress of cooperative research at Ankey, Ia., and Toledo, Ohio, organized by the US Department of Agriculture to increase the borer resistance of maize, is outlined. Inbreds with a high degree of resistance to the first leaf-feeding brood of the European corn borer have been selected from numerous breeding programmes, and have been crossed and backcrossed to a dozen or more susceptible inbreds, which are otherwise agronomically desirable and suitable for production of double cross hybrids. Numerous lines with effective resistance have been obtained and these are being self-pollinated so that double cross hybrids may be developed. Trials have shown that at least three resistant inbreds are necessary to produce hybrids with a high degree of resistance.

Inbreds WF 9 and B 14 have shown considerable tolerance of the second stalk-breaking brood of the corn borer; the plants remain erect and their ears can be harvested mechanically in spite of infestation. Both inbreds have been incorporated in the back-crossing programme. Other lines suitable for breeding purposes possessing tolerance or resistance are being sought among open-pollinated and synthetic varieties and existing inbreds and hybrids in all maize-growing states.

322 **"Tailored" Okla. 301.**
Sth. Seedsman 1952 : **15** : No. 8 : p. 36.

Oklahoma 301, a late maturing yellow hybrid maize developed from (CI 21E x K 201) x (Okla. 12 x Kys), has been released by the Oklahoma Agricultural Experiment Station. It is well-adapted to local conditions; on soil of high fertility it gives an average grain yield of 86·6 bushels per acre compared with an average of 81·8 for other late maturing hybrids. Although Okla. 301 grows taller than other hybrids of the same maturity, it is less liable to lodge and shows a lower percentage of earworm damage because the husks envelop the ears more tightly.

323 EDEN, W. G.
Effect of husk cover of corn on rice weevil damage in Alabama.
J. Econ. Ent. 1952 : **45** : 543–44.

The degree of rice weevil damage on 29 maize varieties and hybrids grown at Auburn, Ala., in 1949 and 1950 was measured at harvest. Dixie 18, a hybrid with ears well-enveloped by husk during ripening, had only 2·2% kernel damage, whereas US 13, having a poorly developed husk, showed 26·1% weevil damage. Analyses of variance revealed a highly significant relationship between husk cover and resistance to weevil.

324 KERLE, W. D.
Maize hybrids and varieties. District recommendations for 1952 sowing.
Agric. Gaz. N.S.W. 1952 : **63** : 286–89.

Hybrids and open-pollinated varieties recommended for grain production, green fodder or silage in different regions of New South Wales are listed. All the hybrids have yielded well in the extreme wet and dry seasons experienced within the last three years.

BARLEY

325 EHRENBERG, L. and NYBOM, N.
Chemical and biological effects of neutrons and X-rays.
Hereditas, Lund 1952 : **38** : 481–501.

At the University of Stockholm the energy absorption or dose of ionizing radiations has been determined in barley embryos by a method involving an indicator reaction occurring in a solution of the same atomic composition as the plant tissue; the reaction is independent of ion density. Comparisons between the röntgen equivalents of doses of fast neutrons, fast protons and β and α rays have shown that fast neutrons are at least 20 times more effective than X rays in producing lethal effects, chromosomal rearrangements, sterility and gene mutations.

326 AUFHAMMER, G.
Züchtung und Umweltgestaltung zur Gewinnung qualitativ hochwertiger Brau- und Futtergerste. (**Breeding and control of environment for producing malting and feeding barley of high quality**).
Landw. Forsch. 1952 : 2. Sonderheft : 93–103.

In breeding four-rowed winter fodder barleys, where the opposition between yield and quality does not occur, yields of well over 50 kg. per acre have been attained at the Weihenstephan plant breeding institute in Bavaria, in crosses of the following type: [(Ragusa alternative barley x Peragis 12 winter barley) x (Heil's Franken spring barley x Friedrichswerther Berg winter barley x Tschermak's two-rowed winter barley)] x [(Ragusa alternative barley x Mahndorfer winter barley) x (Bolivia x Ragusa)]. The best hybrids are resistant to mildew and rust, have short straw tolerant of high manurial dressings and are rich in protein.

German malting barleys are all of the Isaria type and 80–90% of them have Isaria in their parentage. Recent improvements have been mainly in the capacity to utilize soil nutrients and in disease resistance. Studies of quality must in future take into account the nature of the enzymes in the grain as well as its nitrogen content. Two-rowed winter malting barley is again gaining in popularity and enjoying the attention of plant breeders. Average figures for the last five years show that the mildew-resistant spring barleys have yielded at least 10% more grain than susceptible types, and the resistant Ragusa alternative barley is now being used in breeding winter barleys too. The mildew-resistant hybrids are also lower in husk and protein content and higher in extract; the best of them are enumerated. Attention is also being given to barley rusts and to composition of the protein as opposed to its amount, and figures in the literature are cited to show that both protein content and extract are hereditary varietal characters.

327 FEĬCARENKO, A. I.
(Obtaining wheat plants from barley grains).
Agrobiologija (Agrobiology) 1952 : No. **4** : 121–22. [Russian].

A seed sample of branching wheat, obtained by the Ljgov State Breeding Station from Georgia, contained some hulled barley with a 1000 kernel weight of 50 grm. This material was sown upon rich soil for multiplication. Most of the plants grew vigorously and developed normal barley ears. One plant, however, while resembling a multirowed barley of subsp. *vulgare* produced a wheat ear. This bore 41 large white vitreous grains weighing 2·1 grm. This seed, when sown again, gave four distinct types of wheat, two forms of *Triticum durum* var. *leucurum*, *T. durum* var. *murciense* and *T. vulgare* var. *Barbarossa*. All types showed good tillering capacity and produced large grains.

328 HAGBERG, A., NYBOM, N. and GUSTAFSSON, Å.
Allelism of erectoides mutations in barley.
Hereditas, Lund 1952 : **38** : 510–12. (Abst.).

Diallel crossings carried out between numerous erectoid mutants have revealed at least 14 loci which, after mutation, affect ear compactness. Some loci are more mutable than others; 8 independent mutations were found to have occurred at one locus, whereas 10 of the 14 loci have as yet undergone only a single mutation. Since mutants resulting from changes at the same locus are phenotypically distinct, with respect to the degree of compactness of the ear, they are assumed to represent different multiple alleles.

Linkage studies in progress with mutants of Gullkorn [Golden barley] have already indicated linkage between two loci, while some of the other erectoid factors segregate independently.

329 E-N., G.
Många nyheter i arbetet vid Svalöv. **(Many new developments in the work at Svalöf).**
Lantmannen, Stockh. 1952 : **36** : 608–09.

In this brief account of the annual meeting of the Swedish Seed Association, the collection of mutant hybrids obtained by crossing X irradiated barley receives special mention. The value of such mutants as parents for crossing with commercial varieties is to be explored. Some light green mutant lines that have proved practically resistant to loose smut will also be used in crosses.

Black stem rust resistance in wheat has also been extensively tested during the severe outbreak of this disease (cf. Abst. 251).

Some new ryes have been bred and the new early black oat Blixt [Lightning] is cited as an example of transgressive segregation. A winter rye, Å 01600, suitable for Norrland, is also mentioned.

Breeding of herbage plants, oil crops and root crops has also been actively pursued (cf. Abst. 167).

330 YAMAMOTO, K.
Investigations on "viviparous" germination of seed in barley varieties in Japan.
Rep. Inst. Agr. Res. Tohoku Univ. 1951 : **3** : 13–27.

Germination tests on the detached ears of 190 barleys have revealed varietal differences in the capacity to sprout in the ear; the varieties could be classified into 14 groups. Hybrid seed from reciprocal crosses between varieties having a strong tendency towards dormancy and those germinating readily showed xenia with respect to dormancy. The evidence from several experiments suggests that the varietal differences are due to variation in oxygen permeability of the seed coat and in the oxygen requirements of the embryo for germination.

331 JUNGFER, E.
Versuche zum Problem der Reizfruchtung an Gerstenbastarden. **(Experiments on the problem of apomictic fruiting in barley hybrids).**
Züchter 1952 : **22** : 175–79.

Emasculated spikelets of barley hybrids were treated with live rye pollen, dead pollen of rye and *Dactylis glomerata*, flour and various other stimulants. The degree of homozygosity in the few plants obtained in the offspring was not greater than would be expected from selfed progeny and there was no evidence of the formation of apomictic progeny.

332 HÄNSEL, H.
Studie über seitliche "Ausladung" und Anzahl der Keimwurzeln verschiedener Gerstensorten mit besonderer Berücksichtigung ihres Verhaltens nach Vernalisation. (**Study on the lateral spread and number of seminal roots of different barley varieties with particular reference to their reaction to vernalization**).
Z. Pflanzenz. 1952 : **31** : 359–80.

The grains of 24 barley varieties were attached with Durofix to filter paper which was kept upright by glass plates and moistened from below. The angle at which the seminal roots diverged from one another proved characteristic for the variety. No consistent differences were noted between spring and winter barleys, or two and six-rowed types, but greater variation between varieties was evident in the spring group than the winter group. Significant differences were also noted in number of seminal roots, the lowest being an average of roughly 5 in Friedrichswerther Berg and the highest over 7 in Weibull 4994 and Beaven's Archer; two-rowed varieties had slightly but significantly higher values than six-rowed, and spring barleys somewhat higher than winter.

The spread of the roots was greater at higher temperatures than at low. Seed that had been previously vernalized by low temperature had less spread than untreated seed, both in spring and winter barleys; the cold treatment caused considerable damage to the seminal roots in varieties that were not winter hardy. A reduction in spread resulted also from treatment with certain growth substances.

No correlation was observable between the spread and winter hardiness or root number.

333 SHAKUDO, K. and KAWASE, T.
(**Studies on quantitative inheritance. VII. B. Barley. *b.* Studies on the inheritance of culm height and on the quantitative genes controlling it. 1. On the genes, *A*, *E* and *H*, controlling the type of awn and ear, on the inhibitory genes I_1 and I_2 affecting awn length, and on the quantitative effects of these genes**).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 125–28. [Japanese].

Advanced generations of three Japanese barley crosses have been analysed to calculate the effect of each of the above genes on culm height and to determine the mode in which they interact in respect of this characteristic.

334 LAMBERT, J. W. and LAING, T. J.
Studies of various characters of six-rowed segregates from crosses between two-rowed and six-rowed barleys.
Agron. J. 1952 : **44** : 364–69.

Data are presented concerning grain yield and uniformity of kernel size, weight and number in 76 F_4 lines developed at St. Paul, Minn., from six-rowed segregates of Mars x Spartan and Spartan x Minnesota II–34–35; comparisons are made with Spartan, the two-rowed parent, and with Mars, Minnesota II–34–35 and other commercially grown six-rowed barleys. All F_4 lines showed a decrease in seed size and number of kernels per ear compared with the parents and commercial standards, but in respect of grain yield, bushel weight and kernel plumpness the F_4 lines proved superior. Derivatives of Mars x Spartan outyielded lines from Spartan x Minnesota II–34–35, and produced more ears per row, higher bushel weight, higher 1000 kernel weight and plumper kernels than the latter. Both hybrid lines exhibited a high positive correlation (+ 0·77) between the ratio of number of lateral kernels to number of central kernels and the ratio of average weight of lateral kernels to average weight of central kernels. The hybrids showed less uniformity than the standards with respect to the size of lateral and central kernels and the degree of fertility of central and lateral spikelets, many of the latter being sterile.

Selections from the F_5 of Mars x Spartan have consistently outyielded the standards for three years, indicating that hybridization between two-rowed and six-rowed varieties may be a useful means of increasing yields, particularly for fodder barleys. The method is however less useful for breeding malting varieties, in which a high degree of spikelet fertility and uniformity of kernel size are of great importance.

335 YAMAMOTO, T.
(**Morphological and functional differences between the anthers of single florets in barley**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 345–48. [Japanese].

The angle of divergence of the lobes of the anther opposite the outer glume has a characteristic value, which is positively correlated, both within single spikes and between different strains, with the degree of sterility of the floret.

336 **New barley variety "Harlan" suitable for irrigated lands tested by dominion experimental station at Lethbridge.**
Canad. Grain J. 1952 : **8** : No. 1 : p. 29.

A long programme of hybridization, carried out at Lethbridge, Alta., has resulted in the release of Harlan, a six-rowed variety suitable for irrigated areas in western Canada.

337 KENNERLY, A. B.
Lush green forage for bleak winter.
Sth. Seedsman 1952 : **15** : No. **7** : 32, 44.

In an account of the performance of Goliad barley (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1928), reference is made to the cross Juliaca x Peatland from which the new variety was derived. Goliad inherits the resistance of Juliaca to powdery mildew and leaf rust, and the resistance of Peatland to stem rust and *Helminthosporium* leaf blotch.

338 ABDUR-RASHEED MOHAJIR, ARNY, D. C. and SHANDS, H. L.
Studies on the inheritance of loose smut resistance in spring barleys.
Phytopathology 1952 : **42** : 367–73.

The inheritance of resistance to loose smut was studied in crosses and back crosses involving the following varieties and selections: Abyssinian; Arthritis (Maison Carré x Manchuria); Jet from Abyssinia; Valentine (Trebi x Chevron); CI 1413 from Australia; CI 5324, a selection from a composite cross; H 46–4–4–6–7 (Chevron x Brachytic); H 47–28 (Trebi x Chevron); X 191–24 (Barbless x Newal); X 217–57–4 (Barbless x Trebi); X 237–3 (Barbless x Dorsett); X 238–3 [(Oderbrucker^2 x Lion) x Dorsett]; and X 255–1 [(Barbless x Olli) x (Barbless x Chevron)]. In the susceptible x resistant crosses and their reciprocals resistance was dominant to susceptibility. The resistance of Abyssinian and Jet was found to depend upon two pairs of factors in crosses with the susceptible X 255–1 and moderately susceptible Arthritis. X 237–3 possessed one pair of genes for resistance, derived from Dorsett. The F_4 of the cross between the resistant barleys CI 5324 and H 47–48 showed no segregation for loose smut resistance; the F_3 gave an indication of slight transgressive segregation. These two varieties appear to possess at least one factor for resistance in common. Inconclusive evidence of an association of loose smut resistance with the two-rowed character was obtained in crosses involving Abyssinian or Jet.

339 SCHALLER, C. W. and WIEBE, G. A.
Sources of resistance to net blotch of barley.
Agron. J. 1952 : **44** : 334–36.

A total of 4526 barley varieties, representative of the world collection maintained by the US Division of Cereal Crops and Diseases, were tested at Davis, Calif., for their reaction to *Helminthosporium* net blotch for three consecutive years. Only 75 showed a sufficiently consistent reaction to be included in a programme of breeding for resistance; the majority of these originated from Manchuria. Six varieties completely free from lesions were Canadian Lake Shore, Tifang, Manchu, Ming, Harbin and Velvet 26–95.

340 ELLE, T.
Sortforsøk med seksradsbygg på Opplandene. (**Variety trials with 6-rowed barley in the Uplands**).
Forskn. Fors. Landbr. 1951 : **2** : 323–53.

Variety trials of Maskin [Machine], Asplund, Jotun, Varde, Herse and Opal B were carried out in the central part of eastern Norway in two series, one during 1938–48 and the other 1944–48. On the average for the whole 59 experiments, Varde (Maskin x Asplund) proved superior to the rest both in the lower and higher lying districts. It outyielded the control Maskin by 30–50 kg. of grain per dekar. The next best were Herse (Maskin x Asplund) and Asplund which were little inferior in yield of grain under favourable conditions but showed greater variation and a more marked reaction under unfavourable conditions in dry regions. Asplund also tends to produce weak straw.

341 SISLER, W. W. and STOA, T. E.
Barley varieties suited to North Dakota.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1952 : **14** : 138–43.

On the basis of yield trials conducted at different stations since 1945, the malting barleys Kindred and Montcalm and the fodder barley Tregal are recommended for a wide area. Vantage is an outstanding fodder variety in northern regions.

342 Forsøg med bygsorter 1945–1950. (**Trials with barley varieties, 1945–50**).
Tidsskr. Planteavl 1952 : **55** : 550–53.

In continuation of the barley studies already recorded (cf. *Plant Breeding Abstracts*, Vol. XXI,

Abst. 1039), trials were carried out at ten Danish experimental stations in 1949 and 1950, when the varieties Plougstrup 544, Heimdal, Herta and Fero were included for the first time in these experiments.
Of the three varieties in trials over 6 years, Ymer gave the highest yield of grain, 44 hkg. per ha.

343 Société d'Encouragement de la Culture des Orges de Brasserie et des Houblons en France, SECOBRAH. Rapports sur la campagne 1950. **(Society for the Promotion of the Cultivation of Malting Barleys and of Hops in France, SECOBRAH. Reports on the 1950 season).**
Paris 1950 : Pp. 62.

The society presents a further report (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2666) on the results of various winter and spring barley trials conducted in many parts of France. The report, which is mainly in the form of graphs and tables, deals largely with vegetation and manuring experiments.

MILLETS AND SORGHUM

344 Sokolov, G. A.
(Creation of green belts in the sandy deserts of Kazahstan).
Priroda (Nature) 1952 : No. 7 : 69–72. [Russian].

The productive millets Bersievskoe [Bersiev] and Ašambaevskoe, the lucernes Priaraljskaja and Tibetskaja [Tibet] and an *Agropyron* Aktjubinskii Mestnyi [Local Aktjubinsk], which carry resistance to drought, have been developed at the Priaraljskaja Research Station.

345 Varenica, E. T.
(The method of hybridizing *Setaria*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 16–20. [Russian].

Egorjevskaja, Istrinskaja [Istrin], Mordovskaja [Mordva], Bučanskaja, Černigovskaja [Černigov] and Želtozernaja 623 [Yellow-Grained 623] have been recently selected for their earliness and moderate warmth requirement in the Moscow province. It is thought that inter-varietal hybridization may increase the size of the grain in Egorjevskaja, and that of the panicle in Istrinskaja and Mordovskaja and improve the length of culm in Želtozernaja 623. A method of emasculation, consisting of submersion of the panicles in hot water for several minutes, has been developed.

346 Šulyndin, A. F.
(Hybrids between *Setaria italica* subsp. *maxima* and *S. italica* subsp. *Moharium*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 34–36. [Russian].

Descriptions are given of the F_1 and F_2 of natural hybrids between the above subspecies. The hybrids were found in a field at the Institute of Genetics and Breeding of the Ukrainian Academy of Sciences. Some productive plants with large panicles bearing more grains per plant than the initial forms were selected in the F_2.

347 Hrishi, N. J.
Studies on the cytogenetics of six species of pennisetums and their comparative morphology and anatomy.
Genetica 1952 : **26** : 280–356.

Cytogenetical examination of six species of *Pennisetum* grown at the Millet Breeding Station, Coimbatore, has shown that *P. Hohenackeri* ($2n = 18$) and *P. Alopecuros* ($2n = 18$), previously considered synonymous, are distinguishable on the basis of mean chromosome length, 2·17 μ and 2·44 μ respectively. Similarly, *P. Ruppellii*, formerly considered synonymous with *P. orientale*, is shown to have 27 somatic chromosomes, whereas *P. orientale* is obviously distinct ($2n = 36$). Since at meiosis no higher associations than bivalents were found, it is assumed that *P. orientale*, *P. clandestinum* ($2n = 36$) and *P. polystachyon* ($2n = 54$) are allopolyploids with nine basic chromosomes.
Although normal meiosis was observed in *P. clandestinum*, all pollen mother cells degenerated after tetrad formation and, consequently, all reproduction in this species was vegetative. Abnormal growth of tapetal tissue may be responsible for the degeneration of otherwise normal cells.
The high percentage of seed set by the triploid *P. Ruppellii* is also unusual; 13 bivalents were formed regularly at meiosis, with a single univalent. The possible origin of this species is discussed, with reference to its narrow leaves, resembling those of the diploids, and the

panicle which closely resembles that of the tetraploid *P. orientale*. It has been suggested that the species may be facultatively apomictic.

348 DAVIES, F. F. and SIEGLINGER, J. B.
Dwarf Kafir 44-14 and Redlan.
Bull. Okla. Agric. Exp. Sta. 1952 : No. B–384 : Pp. 11.

Detailed descriptions are given of the two new grain sorghums recently released for combine harvesting in Oklahoma (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 960 and Vol. XXII, Abst. 402). Redlan was developed from the F_3 of (Kafir x Milo 8–2–6) x Standard Kafir.

349 FRANZKE, C. J. and ROSS, J. G.
Colchicine induced variants in sorghum.
J. Hered. 1952 : **43** : 107–15.

At the South Dakota Agricultural Experiment station, treatment of germinating seedlings of the true-breeding sorghum Experimental ⁎ 3 [(Day Milo x Sudan grass) x (Day Milo x Black Amber)] with 0·5% colchicine has given rise to a number of different variants resembling their ancestral forage or grain types in growth rate, plant height, size of leaf and panicle, or in spikelet and seed characters. In no case was the chromosome number changed ($2n = 20$), nor were irregularities apparent at meiosis; most of the variants proved fertile and have bred true up to the F_3.
Excised root tips of *Sorghum vulgare* treated with 0·5% colchicine showed typical somatic reductional groupings (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1594) at mitosis. It is possible that in the treated coleoptiles chromosome splitting may have occurred subsequent to the formation of haploid cells, thus restoring the diploid number in a homozygous manner; the fortuitous viable combination would confer a selective advantage to any such cell, giving rise to a mass of tissue from which a new growing point could emerge. Since sorghum is probably of polyploid origin, it is conceivable that chromosomes bearing several segments derived from one of the ancestors of Experimental ⁎ 3 may thus have been concentrated in one cell, producing a plant genotypically distinct from the original zygote.
Observations made on progenies from crosses involving different colchicine-induced variants indicate that the mutant characteristics segregate normally in the F_2. Several variants are being incorporated in the local breeding programmes.

350 STEPHENS, J. C., KUYKENDALL, G. H. and GEORGE, D. W.
Experimental production of hybrid sorghum seed with a three-way cross.
Agron. J. 1952 : **44** : 369–73.

A preliminary report is given on a male sterile form of Day sorghum discovered by chance near Cookeville, Tenn. In crosses with some varieties of sorghum at Chillicothe, Tex., the male sterile Day produced an F_1 in which all plants were completely or partially male sterile, whereas when certain other varieties were used to pollinate the original male sterile type or the male sterile F_1 all plants in the subsequent generation were completely fertile. Although the mode of inheritance of the factors causing sterility has not yet been fully determined, and partial fertility has not been completely eliminated from any segregating stock, it is likely that this form of male sterility will facilitate the commercial production of hybrid seed by a technique involving maintenance of three stocks and two isolated crossing blocks. Stock A, possessing the male sterile characteristic, will be crossed with stock B, a type producing a male sterile F_1 when crossed with A; the single cross progeny will then be crossed with stock C, a type which produces progeny with normal flowers and a high percentage seed set. Thus (A x B) x C will produce the hybrid seed.
Breeding work is in progress, but lines which produce a satisfactory commercial grain sorghum suitable for combine harvesting have not yet been developed.

351 **Darset darso moves combine sorghum eastward.**
Seed World 1952 : **70** : No. 8 : p. 8.

The grain sorghum Darset with dwarf habit is being released by the Oklahoma Agricultural Experiment Station. It was developed by crossing Okla. 1 darso and a dwarf darso-kafir hybrid, and back-crossing to Okla. 1. It matures earlier than Okla. 1. Both Darset and Okla. 1 are resistant to *Pythium* rot.

352 SMITH, J. B. and HARVEY, P. H.
Tar Heel farmers find a dry weather standby. Research and farming.
Progr. Rep. N.C. Agric. Exp. Sta. 1951 : **10** : No. 1 : 6–7.

Brief descriptions are given of 10 drought resistant grain sorghum varieties which are recommended for summer forage in North Carolina on the basis of results of trials carried out in 1951.

RICE

353 Silva, M. Vianna e
Bibliografia orizícola Portuguesa 1800–1950. (**Portuguese rice bibliography 1800-1950**).
Comiss. Reg. Comércio Arroz, Lisboa 1951 : Pp. 53.

A classified list is presented of works connected with rice published in Portugal during the period in question. It contains sections on botany and systematics, biology and physiology, breeding and selected seed, genetics and cytology, and pests and diseases.

354 Kirk, L. E.
Food and Agriculture Organization, seed testing and crop improvement.
Proc. Int. Seed Test. Ass. 1950 (1951) : **16** : 381–88.

Some indication is given of the work done by FAO in promoting cooperation between rice breeders, thus improving breeding techniques in many countries and accelerating the development of new varieties with desirable characteristics (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1939).

355 Matsuo, T.
(**The present position of rice breeding in Japan**).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : p. 114. [Japanese].

A note is presented outlining the present Japanese organization for the breeding and testing of new rice varieties.

356 **Administration report of the agricultural department, Travancore-Cochin, for the year 1950-51** (1952) : Pp. 50.

Single plant selection of the three indigenous varieties of Viruppu rice, Vattan, Chembavu and Cheera, continued. The main results of extended trials with several introduced strains are given. Multiplication and distribution of Cochin 1, CO 16, the Viruppu varieties PTB 7 and 8, and the Mundakan varieties Adt. 1 and 2 were also effected.

357 Marie, R., Denoy, I. and d'Armancourt H.
La rizière du Merle en 1951. (**The rice plantation at Le Merle in 1951**).
Progr. Agric. Vitic. 1952 : **69** : 229–41, 258–69.

In continuation of the research at Le Merle (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1945), the following work was carried out: observations on vegetative period, tillering and fertility in the existing collection and in varieties introduced in 1951; comparative yield trials of varieties likely to be suitable for growing in France; multiplication of lines for the production of pure seed; and hybridization to obtain new improved types and to elucidate the inheritance of red grain.

The F_2 has been reached in the crosses made in 1949 to improve Italian varieties. The cross Balilla Rouge [Red Balilla] x Sesia provided evidence that red grain is dominant to white. The red colour may arise by mutation.

Among the varieties of special promise for French conditions were Maratelli x Balilla, in spite of its lateness. Razza 77, S. Novelli 14, Maratelli and Americano 1600–1 were subject to lodging, whereas the five varieties Balilla, Stirpe 136, Sesia, Ds Hyb. 41 Malgache 4 and Americano 1600–20 were not.

358 Nagao, S. and Takahashi, M.
(**Studies on rice hybridization. XIII. Further studies on gene *Pl* controlling anthocyanin coloration of the leaf**).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 129–36. [Japanese].

Pl brings about purple pigmentation of the stem and leaf in the presence of appropriate apiculus chromogenes at the loci *C* and S_p. Coloration is inhibited in the centre of the lamina when I_{pl} is also present.

Pl is linked with the dwarf gene d_2 and with *lg*, a factor for liguleless leaves.

359 **Cooperative rice hybridization project.**
Inter. Rice Comm. News Lett. 1952 : No. 1 : 2–3.

The progress of the hybridization programme sponsored by FAO at the Central Rice Research Institute, Cuttack, Orissa, is reviewed (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1939). Although some degree of spikelet sterility was encountered in the F_1 of certain crosses, sufficient F_2 seed has been produced for distribution to participating countries where selections will be made under local conditions.

The Indian Council of Agricultural Research has also undertaken a similar project; 60 representative *indica* rices from different parts of India are being crossed with the *japonica* types selected for the cooperative programme, in order to ensure that numerous improved varieties well-adapted to Indian conditions will be produced.

360 KATAYAMA, Y. and SHIDA, S.
(Inheritance of a variegated rice).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 110–14. [Japanese].

The genetics of the variegated rice Fukuijima [Fukui Striped] was investigated. On selfing, small numbers of albino and of green seedlings segregate; the latter breed true to colour with however an occasional reversion. On making reciprocal crosses between Fukuijima and a normal rice, the variegated character showed maternal inheritance.

361 JONES, J. W.
Inheritance of natural and induced mutations in Caloro rice.
J. Hered. 1952 : **43** : 81–85.

The following mutant characters which arose spontaneously in the rice variety Caloro at the Biggs Rice Station, Calif., were found to be simple recessives: compact plant habit; two types of physiological disease; hull spots; short internodes; rolled leaves; neck leaves; coarse culms; and small florets of variable size in a haploid form. A partly sterile mutant with compact panicles and another mutant with shorter stature and smaller seeds than normal Caloro were produced by X ray treatment of the seed. A number of sterile forms arising spontaneously included aneuploids. Selection for four years did not lead to improvement in the fertility of tetraploid lines.

362 DUARTE, A. J. S.
Algumas considerações acerca do melhoramento do arroz pela selecção genealógica. **(Some considerations concerning the improvement of rice by genealogical selection).**
Rev. Agron., Lisboa 1948 : **36** : 53–67.

The inheritance of quantitative characters is discussed and illustrations are given to show the difficulty, or practical impossibility, of producing a line that is pure for all its genes. Certain hereditary correlations are noted and it is concluded that a system of constant selection is necessary to maintain and improve the yielding ability and other qualities in cultivated rice.

363 La sélection des plantes vivrières à Yangambi. Le riz et le manioc. **(Selection of food plants at Yangambi. Rice and cassava).**
Bull. Inform. Inst. Nat. Étud. Agron. Congo Belge (INEAC*) 1952 : **1** : 37–54.

This detailed account outlines the aims, methods and progress made since 1932 at Yangambi (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2542).

364 DUARTE, A. J. S.
As determinações biométricas nas técnicas do melhoramento do arroz pela selecçao genealógica. **(Biometrical determinations in techniques of breeding rice by genealogical selection).**
Genet. Iber. 1951 : **3** : 47–103.

The systems of selection adopted in the main rice breeding countries are outlined, after which the results are presented of biometrical studies made at Sacavém, Portugal, on six selfed lines of the variety Chinês [Chinese], the characters investigated being height, number of tillers, number of panicles, number of spikelets per panicle and per plant, shattering, weight of 100 spikelets and total weight of spikelets. Coefficients of variation were lowest for height and weight of 100 spikelets. Significant differences between the lines were observed in all characters and the best lines in respect of each are indicated. Similar investigations were made in the varieties Muga, Nero Vialone and Ponta Rubra. In this way it was possible to select a line of Chinês combining high yield with low degree of shattering, a line of Nero Vialone combining low shattering with low stature, and a line of Ponta Rubra characterized by high spikelet weight and low shattering. Certain other lines were eliminated as being definitely inferior. There was an apparent correlation between certain characters such as total spikelet weight and weight of 100 spikelets, and total spikelet weight and number of spikelets per plant and per panicle.

365 DE VECCHI, E.
Sviluppi del "Nero Vialone." **(The development of Nero Vialone).**
Riso, Milano 1952 : **1** : No. 5 : p. 10.

The origin of this Italian rice variety is described, with a brief note on its decline owing to adulteration with a red grained hybrid and on its subsequent improvement in grain size by crossing and reselection.

366 SIREGAR, H.
Variëteitenkeuze en lijnenselectie bij rijst. **(Comparison of varieties and line selection in rice).**
Landbouw, Bogor 1951 : **23** : 485–509.

Detailed descriptions are given of rice varieties obtained in Indonesia as a result of (*a*) variety trials, (*b*) selection from land races and from imported rices, and (*c*) line selection from 14 natural populations in various localities. The pure lines isolated include Brondol putih 277 and T 43, Bali kambang 37, Menurun 114, Benong 130 and 131, Djambu 129, Karet 153, and Gropak gede 97 and 106. In a few instances the pure lines, e.g. Benong 130, exceeded the natural population in yield by no less than 20%. In 1947 line selection work on the varieties Beak ganggas, Dendek temu and Balok loas restarted after the war. Beak ganggas shows great variability, comprising: (1) a group with a shorter vegetation period, all stem parts being dead when the plant is ripe, (2) a coarser and lodging resistant group, a week later in ripening, but retaining green stem parts at maturity; and (3) a group intermediate between (1) and (2) in vegetative period and condition of the stem at maturity. In group (2) some lines have been found that appear to be resistant to mentek, a disease very prevalent in western Lombok.

---

* INEAC: National Institute of Agricultural Research in the Belgian Congo.

Selection is also being applied to populations of deep-water rices and two lines, Brondjong 5 and Pudak 5, tolerating a water level of 1·80 m., have been isolated.

367 Datta, R. M.
On the haploid chromosome number of *Oryza sativa* Linn. var. *plena* ("double rice").
Sci. & Cult. 1952 : **17** : p. 441.

Based on cytological observations of pollen mother cells, the haploid chromosome number of the variety is reported to be 12.

368 Sato, K.
(On a dwarf semisterile rice with gaping spikelets. I. Growth of the plant and the characteristics of the panicle and spikelets).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 243–46. [Japanese].

The plant referred to is an aberrant form of the variety Ginbozu [Silver Bonze], possibly a mutant. Its morphology is described; the reduced fertility appears to be due to the unprotected state of the reproductive organs.

369 Takahashi, M. and Tate, S.
(On a new rice mutant termed "compact paniculate sterile." Studies on rice hybridization. XI.].
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 119–24. [Japanese].

A true-breeding mutant of the variety Ebisumochi [Barbarian Glutinous] is described. The mutant is taller than the type; the grains are closer together in the panicle; and abnormal embryo sac development leads to a high degree of sterility.

370 Wagenaar, G. A. W., van Schouwenburg, J. Ch. and Siregar, H.
Semi-sterility of rice hybrids in Indonesia in relation to the *indica-japonica* problem.
Pemb. Balai Besar Penj. Pert. Bogor, Indonesia 1952 : No. 127 : Pp. 21.

Data on the morphological characteristics and compatibility relationships of numerous varieties maintained at the Agricultural Research Station, Bogor, are presented to show the marked differences between the types locally termed tjereh (awnless) and bulu (awned) rices. Hybrids between tjereh and bulu varieties were generally much more sterile than the parent varieties, whereas hybrids between two tjereh or two bulu rices have shown the same degree of fertility as the parent varieties. Baiang and Brondol putih 277, which are morphologically intermediate between both groups with respect to presence of awns, degree of shattering, tillering capacity and photoperiodic reaction, produced fertile hybrids with all tjereh and bulu types except Tjina; all hybrids involving the latter showed a high degree of sterility.

Attention is drawn to the marked correlation between the tjereh types and the proles *indica* of *Oryza sativa* subsp. *communis*, and between the bulu types and the proles *japonica*, in respect of compatibility relationships and other characteristics. The intermediate varieties Baiang and Brondol putih 277, known locally as gundil rices, correspond with the proles *indojaponica*.

371 Ray, G. L.
The third style of *Oryza sativa* Linn.
Sci. & Cult. 1951 : **16** : 371–72.

An outgrowth originating from the junction of the two normal styles and situated opposite the palea has been found in 12 of the 13 rice varieties so far examined. Eight of these varieties had 42% of their florets containing the outgrowth; two varieties had over 82%.

372 Nagao, S. and Takahashi, M.
[On a new gene for apiculus colour in rice. (Studies on rice hybridization, IX. Condensed report)].
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 49–50. [Japanese].

A new gene Sp^{d}, allelomorphic to *Sp* is described, differing from the latter in its weaker effect on the expression of pigmentation.

373 MORINAGA, T. and KURIYAMA, H.
(The genetics of autotetraploid rice).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 36–38. [Japanese].

The genetical basis of purple pigmentation in the ear is discussed, utilizing the segregation ratios obtained in the F_2 and F_3 from crosses between an autotetraploid rice with purple ears on the one hand, and four autotetraploid strains with unpigmented ears on the other.

374 ADAIR, C. R.
The McGill Miller method for determining the milling quality of small samples of rice.
Rice J. 1952 : **55** : No. 2 : 21–23, 38.

A method of estimating the milling quality of small samples by means of the McGill miller is described; it should be useful in testing breeding material.

375 PIACCO, R.
Le razze di riso coltivate in Italia. **(The varieties of rice grown in Italy).**
Ital. Agric. 1952 : **89** : 554–59.

The following characteristics are listed for the 24 most important rice varieties cultivated in Italy: vegetation period; dimensions of plant, spikelets and grains; and the yield of rice.

376 LOVE, H. H.
Rice improvement in Thailand.
Inter. Rice Comm. News Lett. 1952 : No. 1 : 7–8.

Since 1949 many hundreds of indigenous strains from all districts of Thailand, and introductions from India, Indo-China, Indonesia and the USA have been tested for maturity, yielding ability and quality in six different environments. Promising selections were grown in 1951, with standard varieties, at northern and central substations and at the deep-water station at Hantra. A few crosses between outstanding types have already been made but a larger number of selections will be crossed in 1952. Several crosses have been made between *indica* and *japonica* types.

377 SAKAI, K. and SHIMAZAKI, Y.
(Some data on the Ramsch breeding method in rice).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 81–85. [Japanese].

Bulk and pedigree methods of rice breeding were compared by parallel experiments based on the same initial F_2 population from the cross Daikokusosei x Norin 20 [Ministry of Agriculture and Forestry 20]. Selection criteria were yield components, and in one year, resistance to cold. Results are given for the F_3–F_6 generations. The authors conclude that for a quantitative character such as yield, the bulk method is the more efficient.

378 **Dr. K. Ramiah's visit to India.**
Inter. Ric Comm. News Lett. 1952 : No. 1 : 5–7.

An outline is given of rice breeding in progress at research stations visited in Madras, West Bengal and Orissa. Special reference is made to hybridization at Coimbatore, Madras, between a drought resistant hill type and a typical variety adapted to a flooded environment; wide variation has been found in the F_2 with respect to root development and transpiration ratio. It is hoped that high yielding selections, suitable for upland areas of uncertain rainfall, will be secured. Several *Piricularia* resistant strains have been bred at Coimbatore, but these are mainly late maturing; progenies of crosses with early maturing varieties show promise however. In Western Bengal, early maturing hybrids are being developed for areas above 3000 ft., and also for the Damodar Valley, where it may be possible to grow two rice crops in the same season. Hybrids tolerant of flooded saline conditions were being bred at Cuttack, Orissa, but have been transfered to Bhuvaneshwar, where research is also in progress in connexion with crossing *indica* and *japonica* varieties (cf. Abst. 359).

379 BALDACCI, E. and CORBETTA, G.
La malattia dello *Sclerotium oryzae.* **(The disease caused by *S. oryzae*).**
Riso, Milano 1952 : **1** : No. 6 : 14–17.

The rice varieties Chinese originario [Original Chinese], Americano 1600, Variety 77 and, to some extent, Balilla are cited as resistant to *S. Oryzae.* The writers found Maratelli, Sesia, Arborio, Rinaldo Bersani, Pierrot, Franco Roncarolo and Vialone to be susceptible, though Chiappelli has recommended the first three for use on infected plantations.

380 KANDA, M.
The distributions of the injured ears in the rice field attacked by rice stem maggot, *Chlorops orizae* Matsumura, and estimation of optimum size of field-plot.
Rep. Inst. Agr. Res. Tohoku Univ. 1951 : **3** : 35–49.

The distribution of panicles injured by the above pest in two rice uniformity trials did not follow a Poisson distribution but corresponded instead to a summation of a series of Poisson distributions with different means. The optimum plot size for investigations on varietal resistance is a 2-rowed plot, five hills long; many replications are advisable.

381 Calma, V. C. and Aberion, R. B.
Carreon and Inintiw as secondary crops in succession to a primary rice crop.
Philipp. Agric. 1951 : **35** : 37–40.

Trials at the College of Agriculture, Laguna, Philippines, have shown that the rice variety Carreon outyields the commonly grown variety Inintiw by 24 c. per ha. when planted in May.

OTHER CEREALS

382 Schaaffhausen, R. v.
Adlay or Job's tears—a cereal of potentially greater economic importance.
Econ. Bot. 1952 : **6** : 216–27.

A general review is given of edible varieties of *Coix Lachryma-Jobi* grown in Brazil. Considerable diversity has resulted from extensive natural hybridization, and the opportunity for improving productiveness by selective breeding is pointed out. Attention is drawn to an early maturing dwarf type which is not attacked by birds and gives high yields of brown elongated seeds in most areas, including southern states where other strains do not ripen.

FORAGE GRASSES

383 **Annual Report of Progress in Forage Crops Research in Oklahoma conducted by the Oklahoma Agricultural Experiment Station 1951.** (Mimeographed).

In addition to the breeding referred to below, the report summarizes the results of strain and variety tests of grass and leguminous species, and work dealing with problems of seed production.

Andropogon. At anaphase the King Ranch variety of *A. ischaemum* showed a high number of lagging chromosomes. In *A. caucasicus* lagging was less pronounced. The material of both species is probably apomictic. In each case the chromosome number is apparently $2n = 40$.

Some accessions of Asiatic bluestems are predominantly apomictic, whereas others appear to be sexual. Wide crosses are to be made within the complex in the hope of securing immediate fixation of types by apomixis. The taxonomic relationships of the Asiatic bluestems are under investigation. A study is also being made of the relationship between the American species *A. Gerardii* and *A. Hallii*.

The mass selection and isolation block technique applied to grama is also being used in breeding sand bluestem.

Bouteloua. In both sideoats and blue grama, use of mass selection and isolated breeding blocks continued. Valuable strains of both grasses now available are listed, with their chromosome numbers.

Bromus. Preliminary observations indicate that some of the accessions of smooth bromegrass from Turkey are superior to the standard southern type at Woodward; they are expected to prove valuable as breeding material for central Oklahoma.

Buchloe. In buffalo grass breeding at Woodward, hand crossing of selected individuals and lines continued. Progenies of synthetic hybrids were established for the study of performance and sex ratios. The nature of sex determination is under investigation.

Panicum. Two methods of breeding switchgrass are being pursued: open pollination of single plant selections, and use of isolation blocks of matched types. Greenhouse propagation of rhizomatous shoots will permit the maintenance of selections with less trouble than field transplants.

Poa. Some hybrids have been obtained between *P. arachnifera* and several other species.

Sorghastrum. Techniques of bagging and hand-crossing suitable for Indian grass were studied.

Leguminous species. In the project on the selection and breeding of range legumes for western Oklahoma, the value of introductions of Turkish sainfoin and lucerne is being explored. A programme of improving native and exotic pasture legumes has been recently initiated; a large number of introductions have been obtained for evaluation.

In work on bacterial wilt resistance in lucerne, some resistant selections of Oklahoma Common have shown superior combining ability in polycrosses. Selection for resistance to pea aphid is receiving attention. With a view to breeding a pasture type, a study is being made of grazing strains from South Dakota and of Turkish material.

384 Schaepman, H.
Application of the polycross test to grass breeding.
Euphytica, Wageningen 1952 : **1** : 105–11.

The polycross test is discussed with reference to its advantages over other methods of evaluating the combining ability of clones, suitable lay-outs, and its place in the general process of grass breeding.

385 GARDÉ, A.
Breve nota sobre a cariologia de algumas Gramíneas portuguesas. (**Brief note on the caryology of some Portuguese members of the Gramineae**).
Genet. Iber. 1951 : **3** : 145–53.

Chromosome numbers reported for the first time were 2*n* = 14 in *Phalaris aquatica*, *Agrostis Juressi*, *A. truncatula*, *Corynephorus fasciculatus* and *Gaudinia fragilis*, 2*n* = 18 in *Melica Magnolii* and 2*n* = 14 and 28 in *Polypogon maritimus*. The following numbers were confirmed: *Cynosurus echinatus* and *Lolium rigidum* 2*n* = 14, *Airopsis tenella* 2*n* = 8 and *Brachypodium sylvaticum* 2*n* = 18.

386 DE ROO, R.
Het verwekken van tetraploidie in enkele voedergewassen door middel van colchicine. (**The induction of tetraploidy in some forage plants by means of colchicine**).
Meded. LandbHogesch. Gent. 1952 : **17** : 281–92.

The results of the use of colchicine to obtain polyploids of *Lolium perenne*, *Trifolium repens*, *T. pratense* and *Beta vulgaris* at the National Plant Breeding Station at Gent are described. The hay type of perennial ryegrass reacted more readily to colchicine than the pasture type, and tetraploids were more readily induced in cultivated white clover than in the wild form. Seed treatment proved unsuitable for *T. pratense* and *B. vulgaris*.

387 BOR, N. L.
Notes on Asiatic grasses. VI. A new species of *Poa* from Sikkim.
Kew Bull. 1952 : No. 2 : 223–24.

The new species *P. polyneuron* is described.

388 MAGROU, J. and MARIAT, F.
Transformation expérimentale d'une plante annuelle (*Poa annua* L.) en plante vivace. [**Experimental transformation of an annual plant (*P. annua* L.) into a perennial plant**].
CR Acad. Sci. Paris 1950 : **230** : 22–25.

A lowland annual strain of *P. annua* has been induced to perennate by growing it in Paris on soil derived from the Pyrenees. The change is attributed to mycorhizal action.

389 HANSON, A. A., SPRAGUE, V. G. and MYERS, W. M.
Evaluation of Kentucky bluegrass strains grown in association with white clover.
Agron. J. 1952 : **44** : 373–76.

Analyses of variance of annual yields of thirteen strains of *Poa pratensis* representing a wide range of morphological types, seeded with white clover at the US Regional Pasture Research Laboratory, State College, Pa., suggest that relative yielding ability and aggressiveness can be reliably determined provided the strains are well-established and maintained for at least four years. Two distinct mowing treatments did not produce differential strain responses.

390 DEFRANCE, J. A., ODLAND, T. E. and BELL, R. S.
Improvement of velvet bentgrass by selection.
Agron. J. 1952 : **44** : 376–78.

Methods of developing improved strains of *Agrostis canina* at the Rhode Island Agricultural Experiment Station by selection from self-pollinated strains are outlined. Four selections of high quality, A–3, B–11, B–19 and I–12, have recently been obtained as a result of work begun in 1929; B–11, the most outstanding selection, is being increased for commercial release.

391 Timotein jalostustyön tuloksista. (**Results of breeding work with timothy**).
Maatalous, Helsinki 1944 : No. 12 : 218–21.

Breeding methods for obtaining improved strains of timothy at the Jokioinen experimental station are described, and results of experiments on comparative yields are given. The native Jokioinen timothy is taken as a standard, and in the most comprehensive of the experiments, in which the yield/hectare is measured over a 3 year period, the new strain Phl 6 is compared also with the Swedish variety Gloria. Other new strains Phl 3, 44, 32 and 42 were also studied, all showing promising improvements over the local native strain.

392 LAMP, H. F.
Reproductive activity in *Bromus inermis* in relation to phases of tiller development.
Bot. Gaz. 1952 : **113** : 413–38.

Clones of diverse origin and type were studied at the University of Chicago with a view to analysing the relationship between reproductive activity and phases of development in individual tillers, particularly with regard to differences in the ecological cycle for tillers initiated and growing at different seasons. On the basis of percentage of tillers producing inflorescences, clones ranged from highly fertile to relatively sterile. The degree of fertility is partly due to genetical determination, but the positions of individual tillers within the clump and the associated favourable conditions for growth also appeared to have an important effect upon reproductivity in clones tending to be sterile. For individual tillers, whether fertile or sterile at harvest, considerable variation within and between clones was obtained for all the data recorded, such as total number of leaves, distribution of various categories of leaves and number of elongated internodes. The leaf number of a tiller and the developmental state of its growing point were found to be related.

393 MEINERS, J. P.
A new race of head smut on Bromar variety of mountain brome.
Plant Dis. Reptr 1952 : **36** : p. 166.

Bromar, which was released primarily because of its resistance to head smut (*Ustilago bullata*), has shown susceptibility to a new race of the fungus in seed-producing areas in eastern Washington (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1045). It is still however more satisfactory than other strains of *Bromus marginatus*.

394 WIT, F.
The pollination of perennial ryegrass (*Lolium perenne* L.) in clonal plantations and polycross fields.
Euphytica, Wageningen 1952 : **1** : 95–104.

Cross pollination between clones was studied at Wageningen, Netherlands, in unreplicated clonal plantings and in polycross fields, with the aid of the simple dominant character of roughness of culms and upper leaf sheaths. Heterozygous rough clones provided the contaminating pollen; homozygous recessive smooth clones were used as testers. In the clonal plantings, cross pollination rapidly decreased over the first 3 or 4 rows; with farther rows it decreased slowly. Synchronous flowering often had a greater effect on the percentage of crossing than vicinity. Data were obtained indicating that polycrossed progenies are more reliable material for testing genotypes than open-pollinated progenies, since in clonal plantings the various clones are pollinated by genotypically different pollen mixtures, while in polycross fields a genotypically homogeneous pollination may occur. Differences in flowering time and amount of pollen produced may however prevent homogeneity of pollination; further work is required on the proper design of the polycross field.

395 LAFFERTY, H. A.
The seed-analyst, the phytopathologist and the plant-breeder.
Proc. Int. Seed Test. Ass. 1950 (1951) : 16 : 267–75.

The need for cooperation between seed analysts, phytopathologists and breeders is illustrated by an account of blind seed of ryegrass caused by *Phialea temulenta* whose widespread occurrence was discovered comparatively recently. The disease was probably spread by exporting infected seed from Ireland since the last century; most commonly grown strains have proved susceptible. In various countries attempts are now being made to breed resistant strains; it is suggested that sources of resistance may be found in those climatic conditions which favour the growth of both parasite and host.

396 Stammeforsøg med almindelig rajgraes og timothe 1946–50. (**Strain trials with perennial ryegrass and timothy, 1946-50**).
Tidsskr. Planteavl 1952 : **55** : 536–38.

In trials held in Denmark, out of seven late varieties of perennial ryegrass, Sildig Hunsballe II [Late Hunsballe II] gave the best yield of dry matter, 120 hkg. per ha., while Tidlig Stensballe [Early Stensballe] was the best out of four early varieties.

397 DE LITARDIÈRE, R.
Observations caryosystématiques sur le *Festuca paniculata* (L.) Schinz et Thell. [**Caryosystematic observations on *F. paniculata* (L.) Schinz et Thell.**].
Portug. Acta Biol. 1949 : Série B. 113–16.

Forms with $2n = 14$, 28 and 42 have been found, in consequence of which certain modifications are suggested in the taxonomy of the species. Although the polyploid forms do not extend the geographical area of the species, some of them are capable of withstanding greater extremes of ecological conditions than the diploids.

398 **Dallis hybrid may end ergot problem.**
Sth. Seedsman 1952 : **15** : No. 8 : p. 33.

Under controlled environmental conditions at the Mississippi Agricultural Experiment Station inflorescences were produced simultaneously by dallis grass (*Paspalum dilatatum*) and a species of *Paspalum* immune to ergot and producing a high percentage of viable seed. The F_1 resulting from interspecific hybridization was almost completely sterile, but the few seeds produced gave rise to an F_2 and F_3 from which individuals with a high degree of resistance to ergot have been selected.

399 Niwa, T.
On the pollen and its germination of Japanese lawn grass.
J. Jap. Inst. Landscape Architects 1950 : **13** : No. 2 : 4–6.
[from Rec. Res. Fac. Agric. Univ. Tokyo 1950–1951 (1952) : No. 1 : p. 7. (Abst.)].

Pollen germination rates of 14·4 and 8·1% respectively were obtained when pollen of the highly sterile grasses *Zoysia japonica* and *Z. tenuifolia* was sown on a nutrient medium.

400 Duara, B. N. and Stebbins, G. L. (Jun.).
A polyhaploid obtained from a hybrid derivative of *Sorghum halepense* x *S. vulgare* var. *sudanense.*
Genetics 1952 : **37** : 369–74.

At the University of California, a cytological and morphological study has been made of a chance diploid ($2n = 20$) which appeared in the tetraploid ($2n = 40$) F_6 generation, derived from the artificially produced autotetraploid *S. vulgare* var. *sudanense* x the natural tetraploid *S. halepense*. The diploid, which resembles tetraploids of the same generation but grows taller and produces fewer tillers and more panicles, presumably arose by parthenogenetic development of an egg with the reduced chromosome complement. Ten bivalents are generally formed at meiosis; occasionally univalents appear and cause meiotic irregularities and subsequent reduction in the fertility of gametes. This indicates that the two genomes are not completely homologous, although very nearly so, and suggests that neither the F_5 generation nor *S. halepense* are entirely autotetraploid; the latter probably arose as a segmental allopolyploid containing two genomes derived from *S. vulgare* and two genomes from a related species, having chromosomes not quite homologous with those of *S. vulgare.*

401 Rudin, V. D. and Ščerbakova, S. S.
(The content of cyanides in sorghum and the hybrids between sorghum and *Andropogon halepensis* and methods of determining it).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 4 : 46–53. [Russian].

At the Stavropolj Agricultural Institute, two methods of determining hydrocyanic acid content in plants have been developed, a photocolorimetric one, and another based on chemical reaction with iodine. The latter is suitable for mass analyses.

402 Tesar, M. B.
Sudangrass varieties for Michigan.
Quart. Bull. Mich. Agric. Exp. Sta. 1952 : **34** : 350–53.

In trials carried out at four centres from 1949 to 1950, Piper (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2669) outyielded all other varieties; it is therefore recommended to local growers.

403 Burton, G. W.
The immediate effect of gametic relationship upon seed production in pearl millet, *Pennisetum glaucum.*
Agron. J. 1952 : **44** : 424–27.

Over a six-year period, analyses of seed yield from inbreds and top crosses at the Georgia Coastal Plain Experiment Station have shown that certain lines produced significantly less seed when selfed than when top-crossed. Seeds produced by top-crossing were also heavier than those resulting from selfing. These lines gave rise to progenies which behaved in the same way. Eighteen inbreds were found to exert a greater influence on seed production when used as female parents than when used as pollinators. Other lines were highly self fertile and gave equally good seed yields when either selfed or top-crossed; self fertility also proved to be inherited by subsequent progenies.

404 Plummer, A. P. and Frischknecht, N. C.
Increasing field stands of Indian ricegrass.
Agron. J. 1952 : **44** : 285–89.

Preliminary test plantings of *Oryzopsis hymenoides* by the Intermountain Forest and Range Experiment Station, Utah, have demonstrated wide variation among different strains. It appears possible to select superior strains combining good sprouting, wide range of adaptability and high yields of forage and seed.

405 Brücher, E.
"Agrotriticum." Informe sobre un trabajo selectivo de ocho años con híbridos de *"Triticum* x *Agropyron."*
(***Agrotriticum*. Report on eight years of breeding work with *Triticum* x *Agropyron* hybrids**).
Rev. Argent. Agron. 1952 : **19** : 116–26.

The hybrid in question has $2n = 56$ and is considered to be a reduced amphidiploid from the union of 21 *Triticum* chromosomes with 7 from *Agropyron*. It was derived from an F_1 of *T. vulgare* var. *milturum* x *A. elongatum* backcrossed with wheat pollen, followed by selfing and selection for fertility and frost resistance. The hybrid displays regular meiosis with 28 bivalents, is fully fertile and constant; its leaves are harder than those of wheat but are eaten readily by livestock; it produces up to 18 tillers per plant even in dense plantations, the average height being 150 cm. The ears are large, late in maturity and contain 2–3 grains per spikelet, with a thousand grain weight of 27 grm.; the plant regenerates well even after three successive grazings and after the ears have been harvested. The rachis is brittle in most plants but at least one selection with tough rachis has been made. The plants proved highly resistant to drought, owing largely to their exceedingly strong root system; they also display resistance to frost, rust and mildew and are considered promising as forage plants.

406 Vladimirov, I. F.
(The introduction of *Agropyron imbricatum*).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V.I. Lenina (Proc. Lenin. Acad. Agric. Sci. USSR) 1952 : No. 6 : 12–18. [Russian].

Several promising forms of *A. imbricatum* have been selected at the Kuibyšev Botanical Garden from a local hardy population showing resistance to drought. They yield appreciably more seed than the local standard varieties.

LEGUMINOUS FORAGE PLANTS

407 Eynden, G. P. A. v.d.
Problemen bij de lucerneveredeling. **(Problems in lucerne breeding).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 20 February 1952, Wageningen : 462–70. (Mimeographed).

In introducing his subject the speaker discussed: the distribution of lucerne in the Netherlands, France, England and USA; the origin and history of its distribution; the species *Medicago sativa*, *M. falcata* and *M. media* and the winter hardiness of the last named; variation in cultivated lucernes and the Mediterranean and Ultuna types; and the available choice of varieties in N. America and Western Europe.

Objectives in lucerne breeding in Holland are: adaptation to sandy and to acid soils; suitable root type and plant type; improvement of chemical composition; and adequate seed production.

At Ottersum in 1949, progenies of 40 plants each, selected from some 50 varieties, were raised on sandy soil (pH 5·6) and in general it was found that the hybrid lucernes gave the greatest number of well developed plants. A Limburg land race had the highest percentage of good plants. Next came the hybrid lucernes Grimm, Cossack and Rheinische. The Czechoslovakian varieties, which belong partly to the *M. sativa* group, also had a high percentage of superior plants and are very winter hardy and not very exacting as regards soil conditions and also make a good second growth.

A new German land race from Märs has a remarkably prostrate habit and strongly branched roots, but rather coarse stems. It has done well at Ottersum on soil with a pH of 5·9. Possibly a procumbent type with creeping stems for grazing might be bred from it.

In breeding for adaptation to sandy soils at Ottersum some individuals with light coloured flowers were selected out of 2500 Flemish type plants on account of their earliness and rapid aftergrowth.

Seed production of Dutch varieties should be carried out in countries with a more favourable climate, e.g. Hungary and France.

408 Singleton, V. L., Mertz, E. T. and Davis, R. L.
The hydrolysis and amino acid assay of alfalfa, and the methionine range in 100 selections.
Agron. J. 1952 : **44** : 346–48.

At Purdue University Agricultural Experiment Station, Ind., microbiological analysis of the methionine content of 100 lucerne selections with desirable agronomic characters has revealed only slight variation ranging from 72 to 96 mg. per grm. nitrogen. It is however hoped that variations between selections of different genetical background will be sufficient basis for a breeding programme to increase methionine content.

409 Hely, F. W. and Hudson, W. J. C.
Comparative hay yields of various annual medics in the year of establishment.
J. Aust. Inst. Agric. Sci. 1952 : **18** : 102–04.

Considerable variation, with respect to hay yield in replicated ungrazed plots, was found within and between 7 species of *Medicago* at the Wagga Agricultural College and Experiment Station, NSW. Several of the 26 strains of *M. tribuloides* on trial outyielded the two main commercial types; thus there is ample opportunity for selection of improved strains adapted to local conditions.

The lattice design, sampling method and harvesting techniques adopted proved satisfactory for dealing with 64 strains in a limited area, and are recommended for similar trials with large numbers.

410 VOISENAT, P.
Variétés de luzerne actuellement cultivées en France. Orientation donnée à la production des semences et contrôle de l'origine. (**Varieties of lucerne now being cultivated in France. Orientation given to the production of seeds and control of their origin**).
Proc. Int. Seed Test. Ass. 1950 (1951) : **16** : 312–19.

It is pointed out that although lucerne grown in northern, central and southern France originated by hybridization between types from several regions, long cultivation in any one area has produced strains with uniformity in certain characteristics. Methods for maintaining the varietal purity of Flemish, Provence and Poitou lucernes, the three main types now recognized, are outlined.

411 TIHONOV, M.
(**A new lucerne variety Stepnaja 600**).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. **7** : 60–61. [Russian].

Stepnaja 600 [Steppe 600], a natural hybrid between yellow and blue lucernes recently developed at the Dokučaev Institute of Agriculture, is hardy and shows resistance to drought. In recent trials it has proved more productive than the standard Zaĭkevič.

412 DONNELLY, E. D.
Screening for wilt resistance in alfalfa.
Agron. J. 1952 : **44** : 386–87.

In a programme of selection, inoculation by immersing cut roots in bacterial suspension was not efficient enough to eliminate all wilt susceptible individuals in a large population of Ontario Variegated lucerne in which the frequency of genes conditioning resistance to *Corynebacterium insidiosum* was low. Many wilt free selections later proved susceptible when injected by needle. A combination of both techniques is advocated for future selection.

413 WILSIE, C. P.
Alfalfa varieties for Iowa.
Bull. Ia Agric. Exp. Sta. 1951 : No. P111 : 739–56.

Descriptions are given of the 15 principal varieties now in commercial use. The results of field trials of some varieties and strains are surveyed. Among the named varieties, Buffalo, Ranger and Ladak produced the highest forage yields. An experimental synthetic, A–204, outyielded each of these varieties and Grimm by 20%. Information is also provided on the suitability of varieties and experimental strains for short rotations, and on lucernes not adapted to Iowa.

414 CHILDERS, W. R.
Male sterility in *Medicago sativa L.*
Sci. Agric. 1952 : **32** : 351–64.

The cytological basis and nature of inheritance of complete and partial male sterility have been investigated, using the completely male sterile strain, P–1–3 and a fully fertile strain, 50–46, both obtained from the University of Wisconsin. Complete male sterility was found to be associated with abnormal development of the tapetum at the expense of the sporogenous tissue, leading to degeneration of pollen mother cells at early prophase with the tapetum occupying 70% of the anther locule; there was no subsequent anther dehiscence. The F_1 hybrids of P–1–3 x 50–46 had dehiscent anthers; segregation in the F_2 showed a 3 : 1 ratio for dehiscence: nondehiscence in some families and in others the χ^2 value indicated a 15 : 1 ratio. The inheritance of nondehiscence has been attributed to the action of duplicate genes, designated Ms_1 and Ms_2; the male sterile parent is therefore represented as $ms_1ms_1ms_2ms_2$ and 50–46 as $Ms_1Ms_1Ms_2ms_2$.

Variation in percentage of aborted pollen (5–81%) was observed among dehiscent F_1 individuals. Partial male sterility was characterized by tapetal swelling before the first mitotic division of the microspores; some spores became vacuolate but normal grains occurred at random. The degree of pollen sterility in segregating F_1 and F_2 progenies suggests that partial male sterility is determined by three genes, A_1, A_2 and A_3, which segregate at random and act quantitatively. Thus the parental genotypes, relative to partial pollen sterility, are probably $a_1a_1a_2a_2a_3a_3$ (50–46) and $A_1a_1A_2a_2A_3a_3$ (P–1–3).

A significant negative correlation was established between pollen sterility and self fertility.

415 **Is this a new strain of Townsville lucerne?**
Qd Agric. J. 1952 : **75** : 5–6.

In contrast with the commercially grown Townsville lucerne (*Stylosanthes sundaica*), which has a prostrate growth habit and is unable to compete with invading grasses, prostrate individuals found at Dayboro, near Brisbane, have assumed an upright habit in competition with grasses and have produced even stands. The erect form of growth was transmitted to seedling progenies in competition with grasses, but the prostrate habit was resumed in the absence of competition. Seed has been increased for grazing and mowing trials as the new strain appears to be more suitable for pastures than the commercial type.

416 Arnon, J. [Y.].
[**Hay. Methods of production and plants. (Concl.)**].
Hassadeh 1951 : **32** : 58–60. [Hebrew].

Of the clover varieties discussed, Argamanit [Red Clover] is rated highest as it yields heavy crops of hay, can be harvested late, and is free from disease. Huldait [Hulda] is placed second; it was raised by Ephraim Melamed and has to be harvested earlier than Argamanit. Yardenit [Jordan], raised by Daniel Siev, and Mekomit [Local] have a lower germination rate and yield lower crops.

417 Julén, G.
Svalöfs Silo rödklöver (Sv. 026).
[**Svalöf Silo red clover (Sv. 026)**].
Svalöf Katalog för Hösten 1951. Allm. Svenska UtsädesAB, Svalöf 1951 : 10–11.

This new variety is in some respects a new type, combining rapid development with the characteristics of a medium late clover. Derived from a selection from Merkur, it is medium late and very leafy and produces no flower shoots in the year of sowing. In appearance it resembles Merkur, but flowered only 3–4 days later than Essi in trials at Svalöf and is earlier than the typical early Danish clovers Tystofte Early and Øtofte Early. The aftergrowth consists mainly of foliage, but flower bearing shoots are more abundant than in Merkur.

418 Woodrow, A. W.
Effect of time of pollination by honey bees on red clover seed yields.
J. Econ. Ent. 1952 : **45** : 517–19.

Since the florets of individual heads develop in succession and those from which bees are excluded remain in full bloom 9–10 days at Columbus, Ohio, the potential pollination period may extend over 3–4 weeks in a single plot. Pollinated florets wither in less than 24 hours, however, so that where adequate bee populations are maintained, all florets may be pollinated and wither within 4 days from the time the first florets open.

419 Barrales, H. L. and Ludwig, R. A.
The clonal propagation of red clover.
Sci. Agric. 1952 : **32** : 455–62.

A satisfactory procedure for propagating red clover by stem cuttings is described. Clonal lines varied in their ability to root when propagated by this method.

420 Åkerberg, E.
Stamförsök med rödklöver o. lucern. Några erfarenheter från årets stamförsök vid Sveriges Utsädesförenings Ultunafilial. (**Strain trials with red clover and lucerne. Some findings from this year's strain trials at the Ultuna Branch Station of the Swedish Seed Association**).
Lantmannen, Stockh. 1952 : **36** : 589–90.

Disease and pest resistance are required for red clover growing in Central Sweden. The variety Ultuna is reported to be winter hardy and resistant to clover stem rot, while Merkur, also winter hardy, did better on nematode-infested land.

Most of the Swedish late clover strains resemble Ultuna. Sörby-Okna, Årsta and Hjälmarsnäs showed some nematode resistance.

The following three late clover strains equalling Ultuna in hardiness and far superior in resistance to nematode attack have been bred, using Bingefors' special infection method: U 036, a tetraploid from Ultuna; U 056 a diploid from Ultuna; and U 039 a diploid from Hjälmarsnäs. Good new Swedish strains of lucerne have been produced but the seed production problem has still to be solved. In the meantime, imported seed is used including the so-called Flemish types, e.g. du Puits, Chartainvilliers and W 268. All three are however inferior to Grimm in frost resistance, though their recovery at the second cut was good.

421 Multamäki, K.
Koetuloksia puna-apilakannoista. (**Experimental results with red clover strains**).
Maaseudun Tulevaisuus 1949 : No. 56 : Pp. 2.

An account is given of red clover trials on the Jokioinen estate of both native and foreign varieties. Variety Tammisto is taken as the standard in all cases and tables are given comparing hay yield, time of flowering and degree of winter survival.

No clear-cut conclusions have been drawn from the experiments as a whole, but the standard Tammisto has shown itself reliable. Certain Swedish varieties have proved successful.

422 **Ala-Lu affords near year-round grazing.**
Sth. Seedsman 1952 : **15** : No. 9 : p. 62.

A brief account is given of the performance of Ala-Lu white clover, which grows vigorously, spreads rapidly and withstands grazing for 10–12 months each year in southern regions of the USA.

423 WOOD, G. M. and SPRAGUE, M. A.
Relation of organic food reserves to cold hardiness of Ladino clover.
Agron. J. 1952 : **44** : 318–25.

Clones of Ladino clover on trial at New Brunswick, NJ, varied in their capacity to resist injury at low temperatures. Chemical analyses showed that the most hardy plants had a high polysaccharide and sugar content; in those clones with a high sugar content, but without proportionally high levels of polysaccharides, severe winter injury was common.

424 YATES, J. J. and BRITTAN, N. H.
Cytological studies of subterranean clover (*Trifolium subterraneum* L.).
Aust. J. Agric. Res. 1952 : **3** : 300–04.

In a breeding programme at the Institute of Agriculture, Nedlands, Western Australia, attempts to develop an early maturing strain by crossing agronomically desirable but late maturing Australian varieties with two early maturing introductions, Palestine and Israel, have been unsuccessful owing to incompatibility. A cytological examination of root tip chromosomes has shown that whereas Dwalganup, Yarloop, Mt. Barker, Wenigup, Burnerang and Red Leaf have 16 small somatic chromosomes with little morphological variation between strains, Palestine and Israel have 12 large chromosomes bearing closer resemblance to those of *Vicia sativa* ($2n = 12$) than to the small chromosomes of *T. subterraneum.* This extreme variability of chromosome number and morphology in phenotypically similar strains accounts for the observed incompatibility. The taxonomic position of Palestine and Israel is discussed in relation to their possible origin by mutation of one or other genus, involving, on the one hand, alteration of the chromosomes without significant influence on external morphology, or, on the other hand, phenotypic variation without much change in chromosome complement.

Further attempts are being made to obtain intervarietal or interspecific hybrids involving either Palestine or Israel, in order to determine the behaviour of chromosomes in subsequent meioses.

425 ŠULYNDIN, A. F.
(The production of a spring form of *Vicia villosa*).
Agrobiologija (Agrobiology) 1952 : No. 4 : 66–69. [Russian].

Winter vetch, which shows resistance to *Fusarium* and *Acyrthosiphon pisi*, was trained for the spring habit at Stavropolj and Harjkov. The method consisted of sowing a hardy winter form for several years as a spring crop using seed which had not passed through the vernalization phase.

The fourth seed generation gave a new variety, which was a few days earlier and appreciably more productive than the local standard Harjkovskaja [Harjkov]. It carried resistance to *Fusarium* and *A. pisi*, but it was more susceptible to cold than the initial material.

Mention is made of productive late long-stemmed spring forms selected from the material in the second and third seed generations.

426 MENKES, J. [Y.].
(Problems of cultivation and improvement of the vetch).
Hassadeh 1952 : **32** : 168–74. [Hebrew].

Between 1946 and 1951, *Vicia sativa* was on trial at Neveh Ya'ar, Ner David and other experimental stations in Israel. Hazer'a 45 surpassed Ragilah [Common] and Yarden [Jordan] in hay yield. The differences in yields were greatest in rainy seasons, when Ragilah and Yarden suffered from attacks of *Peronospora Viciae*, while Hazer'a 45 proved resistant.

427 HUGUES, P. and FERRET, M.
Comportement et rendement de diverses espèces et variétés de vesces. **(Behaviour and yield of different species and varieties of vetches).**
Bull. Tech. Ing. Serv. Agric. 1952 : No. 70 : 361–69.

The varieties of *Vicia sativa*, *V. villosa* and *V. varia* compared in this study comprised vetches from Poland, Bulgaria, Syria, the Lebanon and different parts of France. Earliness and yields of forage, hay and seed are recorded.

428 HANSON, C. H., ALLISON, J. L. and CHAMBLEE, D. S.
The performance of lespedeza strains on rootknot nematode infested soils in North Carolina.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 176–77.

The annual lespedeza variety Rowan, highly resistant to nematode, has been released (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 481). Crosses between Rowan and later maturing strains are now in the F_4; Rowan resembles commercial Korean lespedeza in time of maturity.

429 **New annual white sweetclover developed by Florida scientists.**
Crops & Soils 1952 : **4** : No. 9 : p. 30.

Floranna, an improved strain of sweet clover developed cooperatively by the University of Florida and the US Department of Agriculture, grows vigorously even under adverse weather conditions and is adapted to a wide range of soils.

430 KEPEL, W.
Cechy morfologiczne lubinów wąskolistnych *Lupinus angustifolius.* (**Morphological characteristics of narrow-leaved lupins, *L. angustifolius***).
Wydz. Mat. -Przyr. Kom. Nauk Rolnicz. Lésn. 1952 : **1** : Pp. 44.

The author has evolved a system of classification primarily based on the rate of growth in the early stages of plant development. Two botanical varieties are named, *L. angustifolius* var. *properans* which shows rapid growth in the early stages and *L. angustifolius* var. *retardans* which does not exhibit this character. These two botanical varieties are further divided into homologous series each consisting of two subvarieties based on the presence or absence of anthocyanin in the vegetative organs; the subvarieties are further divided into races, according to flower colour.

431 **White lupine promises winter-hardiness.**
Sth. Seedsman 1952 : **15** : No. 8 : p. 68.

During the hard winter of 1950–51 only 12 white lupin plants of a small-seeded Turkish introduction survived at the Georgia Agricultural Experiment Station. These survivors have been crossed with a large-seeded strain in an attempt to improve the winter hardiness of an otherwise agronomically desirable type.

432 TROLL, H. -J.
Viren, deren Schäden und genetische Resistenzfragen bei *Lupinus luteus.* (**Viruses, their damage, and questions of genetical resistance in *L. luteus***).
Züchter 1952 : **22** : 164–71.

Various virus diseases that have been observed in *L. luteus* are described and illustrated. No clear difference in susceptibility between sweet and bitter forms was detected. The degree of susceptibility varied however in hybrid families and also between strains, particularly in the nonpubescent forms which offer less obstacles to transmission of the virus by insect vectors.

433 TOXOPEUS, H. J.
A thornless variety of *Mimosa invisa.* A great improvement of one of the best tropical annual green manures.
Euphytica, Wageningen 1952 : **1** : 130–32.

A true-breeding thornless form has been discovered which probably arose through gene mutation, the thornless condition showing itself only in homozygous recessives. This discovery is regarded as a good example of the practical value of Vavilov's law of homologus series in variation. The new form is expected to play an important part in the reclamation of land in the tropics.

434 CORILLION, R.
Sur l'existence et la répartition des *Ulex* hybrides des landes bretonnes. (**On the presence and distribution of *Ulex* hybrids in the heaths of Brittany**).
CR Acad. Sci. Paris 1951 : **232** : 344–46.

Putative hybrids of *U. Gallii* x *U. nanus* and *U. europaeus* x *U. Gallii* are reported.

ROOTS AND TUBERS

435 NILSSON, R. and BJÖRKLUND, C. M.
Lagringsförsök med olika stammar av betor och kålrötter. (**Storage trials with different strains of mangels and swedes**).
K. LandtbrAkad. Handl., Stockh. 1952 : **91** : 107–115.

Differences between Swedish strains of mangels, sugar mangels and swedes in their percentage yield of dry matter and loss of dry matter following storage are analysed.

436 KLOEN, D.
De veredeling van de voederbiet. (**The breeding of fodder beet**).
Jaarb. Algem. Bond Oud-leerl. Middelbaar Landbouwonderwijs, Wageningen 1952 : 57–72.

In this paper, which is intended to instruct readers in the methods and aims in fodder beet improvement in Holland, the subject is treated under the following heads: varietal selection; preliminary research and criteria in breeding; selection; family selection; decline in vigour due to inbreeding; elimination of bolters; vegetative multiplication; dry matter determinations; inbreeding; induction of polyploidy; male sterility; monogerm seed; interspecific hybridization with wild species; and crossing of beets with high and with low dry matter content.

437 MIZUSHIMA, U.
(**Caryogenetic studies of interspecific and intergeneric hybrids in the Brassiceae and of their polyploid derivatives**).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 30–33. [Japanese].

Extensive details are given on metaphase configurations in hybrids involving *Brassica nigra*, *B. oleracea*, *B. campestris*, *B. carinata*, *B. juncea*, *B. pekinensis*, *B. cernua*, *B. Napus*, *B. Rapa*, *Sinapis arvensis*, *Eruca sativa* and *Raphanus sativus*, and on metaphase configurations, pollen viability and self and cross fertility in digenomic tetraploid derivatives, digenomic hexaploids and trigenomic hexaploids of the above crosses.

438 KRESS, H.
Mitschurin-Lyssenko-Arbeiten in der Saatzucht Gülzow-Güstrow (Mecklenburg). (**Mičurin-Lysenko studies at the Gülzow-Güstrow seed farm, Mecklenburg**).
Mitt. dtsch. LandwGes. 1950 : **3** : 270–73.

Seed of winter rape grafted on cabbage gave seedlings that grew more vigorously in the early stages but less vigorously in the following spring. Scions from the seedling plants have been grafted again on to cabbage to study any further influence. So far the vegetative rapprochement has not made it possible to cross the rape scion with the stock or with marrow stem kale or Brussels sprouts, though the fruits of the first-named cross show promise of producing a few seeds.

Winter rape was also grafted on marrow stem kale and flowers of the scion pollinated with the stock, with Brussels sprouts and with cabbage. The results so far are not promising.

In grafts of tomato on potato no influence has so far been observed either in the seed progeny of the tomato or the tuber progeny of the potato. Seeds were produced however when the grafted tomato was pollinated with the potato, the average number of viable seeds per fruit being 115. The seedlings were identical with the tomato parent.

Other graft combinations are under investigation.

439 TAI, S. E.
Effects of selfing in Chinese mustards.
Bull. Nat. Hist. Peking 1949 : **17** : 151–68.

Studies on the effect of selfing on the seed production of a large number of Chinese varieties of *Brassica campestris*, *B. juncea* and *B. cernua* showed a marked deterioration in *B. campestris*, but no adverse effects in the other two species.

440 MORINAGA, T. and KURIYAMA, H.
[**Heritable sterility in *Brassica* (*B. napus*)**].
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 35–36. [Japanese].

Three types of sterility are described, the first without effect on the morphology of the plant, the second associated with stunting, while the third was a case of female sterility involving abortion of the pistil but not affecting meiosis. The first two cases were determined by single recessive genes, the third by two complementary recessive genes.

441 Nachtrag zur Sortenliste. (**Supplement to the list of varieties**).
Kartoffelbau 1952 : **3** : p. 143.

A supplementary list of potato varieties whose cultivation is permitted in Germany is issued (cf. *Plant Breeding Abstracts*, Vol. XXII, p. 663).

442 **American potato yearbook 1952** : Pp. 80.

Along the lines of previous issues, the yearbook gives up-to-date information on potato production in the USA, including breeding projects (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 500).

443 FISCHNICH, O. and LÜBBERT, G.
Förderung des Fruchtansatzes und der Fruchtbildung bei Kartoffeln durch Wuchsstoffe. (**Stimulating fruit setting and fruit formation in potatoes by growth substances**).
Kartoffelbau 1952 : **3** : 137–40.

Flowers of a number of varieties were pollinated with other varieties and then sprayed with aqueous solutions of the sodium salt of 2,4,5 T, which materially increased the set of fruit and enabled fertile seeds to be obtained from a number of varietal crosses which normally do not give seed. By treating the tubers of the seedlings with Rindite a second tuber generation of the hybrids can be obtained the same year.

444 Toxopeus, H. J.
Over de mogelijke betekenis van *Solanum demissum* voor de veredeling gericht op verhoging van de knolopbrengst. **(On the possible significance of *S. demissum* in breeding for increased tuber production).**
Euphytica, Wageningen 1952 : **1** : 133–39.

Data have been analysed regarding the tuber production of 615 seedling clones, 530 of which were derived from intervarietal crosses of *Solanum tuberosum*, and 85 from the third and fourth back crosses of *S. demissum* with *S. tuberosum*. The *demissum* hybrids averaged a higher yield of tubers than the intervarietal hybrids and also comprised the highest yielders. It is suggested that the superiority noted may be due to *Phytophthora* resistance and possibly also to some favourable action of the *S. demissum* genes, such as has been observed to follow the use of the wild species *Saccharum spontaneum* in sugar cane breeding.

445 Budin, K. Z.
(The selection of young seedlings of potato).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 4 : 28–33. [Russian].

Breeding methods have been investigated at the Institute of Potato Farming, and as a result some Mičurinite improvements are recommended. The F_1 can be reduced to a much smaller number than normally used as initial material in selection. However, the choice of parental forms and training are important. Only seedlings with an unsatisfactory tuber shape and those susceptible to diseases should be discarded in the seedling nursery, as most economic characters only become apparent in the first or later tuber generations. Selection for disease resistance, earliness, tuber characters, starch content and productiveness must begin in the multiplication nursery, where the final evaluation of yielding capacity and disease resistance is made in the third or fifth tuber generation.

The productive early seedlings 495, 892, 896 and 1474, with a high starch content and resistance to diseases, have been selected.

446 Koopmans, A.
Changes in sex in the flowers of the hybrid *Solanum Rybinii* x *S. chacoense*.
Genetica 1952 : **26** : 359–80.

Although the F_1 of *S. Rybinii* x *S. chacoense* had normal flowers, several F_2 plants had abnormal anthers and, occasionally, abnormal ovaries. Back crosses of plants with abnormal anthers to *S. chacoense* have again produced numerous flowers with the following abnormalities: an extra whorl of ovaries alternating with the staminal whorl; replacement of stamens with open carpels bearing exposed ovules on the margins; rudimentary anthers; and various abnormalities of the corolla.

Since the back crosses failed to produce normal plants there is little possibility of explaining the F_2 aberrants as recessive segregates (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2024). Sexual abnormalities have never been noted in either species, and are thus attributed to the interaction of the two genomes. Meiosis in the F_1 is quite regular. On the other hand, owing to the degenerate anthers of the F_2 which make meiotic observations impossible, it is uncertain whether caryological irregularities occur in the F_2. It is suggested, however, that abnormalities may be caused by incompatibility between plasmon and genome. Several instances of cytoplasmic inheritance analogous with these observations are cited in *Streptocarpus*, *Sempervivum*, *Primula*, *Linum* and *Geranium*. Hybrids from the reciprocal cross *S. chacoense* x *S. Rybinii* are therefore to be studied.

447 Balašev, N. N. and Krjučkova, A. F.
(Growing seed potatoes in Uzbekistan).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 67–70. [Russian].

Planting the potato in late summer and other agrobiological methods guarantee healthy local material. Reference is made to Hibiny **3**, from *Solanum tuberosum* x *S. boyacense*, which has a short growth period and yields a second crop in the same season when planted with freshly harvested tubers.

448 Skvirskaja, S. B.
(Changes in the dormancy periods of potato tubers due to vegetative hybridization).
Priroda (Nature) 1951 : No. 11 : 60–61. [Russian].

The dormancy periods of the F_0 tubers of several potato varieties were curtailed or prolonged when the plants were cleft-grafted with other potato scions. Scions which transmitted short dormancy periods to various stocks included two seedling potatoes bred at the USSR Institute of Plant Industry, (Fram x *Solanum Kesselbrenneri*) x Stärkeragis and (Frühmölle x *S. canarense*) x Katahdin.

449 GREENWOOD, M. L., MCKENDRICK, M. H. and HAWKINS, A.
The relationship of the specific gravity of six varieties of potatoes to their mealiness as assessed by sensory methods.
Amer. Potato J. 1952 : **29** : 192–97.

Six varieties grown at two farms in Connecticut were analysed. On one farm Green Mountain, a variety of high specific gravity, proved very mealy, whereas Chippewa, with the lowest specific gravity, had a watery texture; Katahdin, Kennebec, Mohawk and Ontario were intermediate with respect to specific gravity and degree of mealiness. This close relationship between specific gravity and mealiness was not, however, obvious on the second farm, although differences between varieties were significant. Thus is appears that specific gravity cannot be used as the only criterion for assessing the cooking quality of potatoes.

450 Les variétés admises au contrôle 1952. (**Varieties accepted for inspection, 1952**).
Pomme d. Terre Franç. 1952 : **15** : No. 157 : 2–21.

For the benefit of French potato growers, tabulated descriptions are given of the tubers, plants, physiological characteristics, soil and other requirements, use, yield and starch content of 39 varieties of potatoes. The origin and breeder of each is also given.

451 ANSELMI LAUKIN, M. S.
Estudio preliminar de selección de papa con miras a la creación de un "Instituto de la Papa." (**Preliminary study of potato breeding with a view to the creation of a "Potato Institute"**).
Agronomía, Lima 1952 : **17** : No. 70 : 57–71.

Extensive collections have been made of local cultivated and wild potatoes in Peru and the most promising forms are being selected. Characters examined were yield, cold resistance, number of haulms, and colour of stem, tuber, sprout and flower.

A number of local varieties which enjoy special varietal names are thought to be identical with the common variety Yuracc Paltacc or Chata Blanca [Flat White] of the Cierro de Pasco region. Heterosis has been observed in certain hybrids between *Solanum tuberosum* and *S. andigenum* and a number of other interspecific crosses have been made and are being investigated; they include a hybrid of *S. acaule* x *S. andigenum* sent from England. Paltacc Shiri, a variety of *S. curtilobum*, is being used as a wart-resistant parent, and the variety Jiruco for resistance to insects.

Arguments are presented in favour of establishing a potato research station in Peru, staffed by English and German specialists in potato genetics and biology.

452 APPEL, G. O.
Die Wirkung der Infektionsquellen und der Umwelteinflüsse auf die Erhaltungszucht der Kartoffel. (**The effect of infection foci and of environmental influences on maintenance of pure seed in potatoes**).
Züchter 1952 : **22** : 161–63.

Indications are given regarding suitable isolation distances from infected material and the effect of growth conditions on the production of healthy stock of potatoes.

453 BENSIN, B. M.
Experiments with colchicine treatment of potatoes in Alaska.
Amer. Potato J. 1952 : **29** : 165–69.

Tubers of Katahdin, Teton and other varieties were treated with colchicine and a study was made of the morphology, maturity and productivity of the plants raised from these tubers. Substantial increases in yield were obtained, although tuber shape was very irregular. Morphological modifications and retarded maturity characterized the treated plants, but these could have resulted from a response to the subarctic conditions. The increased yields secured are regarded as being of economic significance in the case of potatoes used for industrial purposes.

454 BUDIN, K. Z.
(**Potato varieties for irrigated agricultural land**).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 70–72. [Russian].

Trials conducted at the Institute of Potato Farming and its branch stations showed that Volžanin [Volga], Voronežskiĭ [Voronež], Sejanec 4185 [Seedling 4185], Sejanec 2813, Uljjanovskiĭ [Uljjanov], Stahanovskiĭ

[Stahanov's], Bogarnyĭ [Rain-fed] and Oktjabrenok [Little Octobrist] were the most productive varieties when grown upon irrigated soil. Breeding varieties for cultivation on irrigated land is in progress at the Stalingrad centre of the institute. The promising material includes the early varieties: 4126, from Volžanin x Ėpron; 3795, an interspecific hybrid; and 4128, from Lorh x Katahdin; and the mid-season varieties 6080 and B–26, also from the last named cross. The yields of these hybrids varied between 408 and 720 c. per ha. in 1950, and between 411 and 460 c. per ha. in 1951.

455 MASSEY, P. H. (JUN.), THOMPSON, H. C. and SMITH, O.
Varietal susceptibility of potatoes to internal black spot.
Amer. Potato J. 1952 : **29** : 127–35.

Internal black spot is apparently a physiological defect involving breakdown of tissue just beneath the skin of the tuber. Black spot index has shown a highly significant and positive correlation with specific gravity. In trials in New York State, locality was found to have an important effect upon the black spot susceptibility of some varieties. Ontario, however, was more susceptible than other entries in almost every locality. Ashworth, Pontiac and Kennebec were the least susceptible.

456 SCHULTZ, E. S.
Powdery scab, a precursor for the late blight infection of blight-immune potato tubers.
Phytopathology 1952 : **42** : p. 343.

Following an outbreak of late blight on the supposedly blight immune variety Kennebec in Maine during 1951, a close association was found between the incidence of late blight and powdery scab (*Spongospora subterranea*). It appears that powdery scab lesions, in which suberization is inhibited, serve as invasion sites for *Phytophthora infestans;* none of the scab free tubers was infected with blight.

457 MÜLLER, K. O. and BLACK, W.
Potato breeding for resistance to blight and virus diseases during the last hundred years.
Z. Pflanzenz. 1952 : **31** : 305–18.

An historical survey of breeding for resistance to late blight and viruses in Britain, the United States and other countries is given, ranging from the earliest attempts to overcome these diseases by developing resistant varieties to recent advances in the genetics of host reaction.

458 ALANDIA BORDA, S.
Ensayos de resistencia a *Phytophthora infestans* con dos especies silvestres de papa. **(Tests of resistance to *Ph. infestans* with two wild potato species).**
Folia Univ., Cochabamba 1951 : **5** : No. 5 : 145–50.

Artificial inoculations of the Bolivian species *Solanum capsicibaccatum* and *S. demissum* from Mexico showed both to be resistant to the biotype of the fungus used, to which the variety Imilla was fully susceptible. Suggestions are given for using the Bolivian species in interspecific crossing.

459 ZAKOPAL, J.
Výsledky zkoušek na vzdornost proti rakovině bramborů. **(The results of testing potatoes for resistance to wart).**
Sborn. Čsl. Acad. Zeměd. 1952 : **25** : 181–84.

Several varieties of potato originating in Czechoslovakia or introduced from other countries showed resistance to wart in trials at Velký Karlovice. However, Carmen and Reneta, which carried resistance in these trials, proved susceptible at Švermov. Similarly, some other varieties and hybrids showing resistance to wart in Czechoslovakia proved susceptible in trials conducted in Germany.

460 THIJN, G. A.
Potato varieties and powdery mildew attacks.
Euphytica, Wageningen 1952 : **1** : 84–86.

In the course of work at the Potato Breeding Station of the Foundation for Plant Breeding, Emmeloord, N.E. Polder, it has been observed that seedlings whose late blight resistance was derived from *Solanum demissum* are very susceptible to attacks by *Erysiphe* mildew in both the field and greenhouse. A number of commercial varieties have also shown mildew. Although the disease has not hitherto been observed in commercial potato fields in the Netherlands, it may be advisable to find parental material with resistance to both late blight and mildew.

461 BOYD, A. E. W.
Dry-rot disease of the potato. IV. Laboratory methods used in assessing variations in tuber susceptibility.
Ann. Appl. Biol. 1952 : **39** : 322–29.

Details are given of a technique for inoculating tubers with *Fusarium caeruleum* by means of a modified hypodermic syringe, which penetrates to a uniform depth of 7 mm. and injects an average of 100 spores.

Considerable variation was observed in the degree of susceptibility of (*a*) different-sized tubers of the same strain and (*b*) the rose and heel ends of the same tuber. In assessing the reaction of varieties, the need for uniformity with respect to size of tuber and site of inoculation is therefore emphasized.

462 Boyd, A. E. W.
Dry-rot disease of the potato. V. Seasonal and local variations in tuber susceptibility.
Ann. Appl. Biol. 1952 : **39** : 330–38.

Over a period of four years tubers of several varieties grown in Scotland were inoculated with *Fusarium caeruleum* at intervals during storage (cf. Abst. 461). The degree of susceptibility varied with each strain; although the susceptibility of all varieties increased up to the early summer of the year following lifting, the increase proceeded at different rates.

Slight variability in the reaction of certain stocks of the same strain has been correlated with environmental conditions, particularly soil differences; under uniform conditions, this variability is no longer apparent.

463 Boyd, A. E. W.
Dry-rot disease of the potato. VI. Varietal differences in tuber susceptibility obtained by injection and riddle-abrasion methods.
Ann. Appl. Biol. 1952 : **39** : 339–50.

In tests with some 20 commercial varieties at Corstorphine, Edinburgh, general agreement was observed between the relative susceptibility indices determined by direct tuber inoculation with *Fusarium caeruleum* and by abrasion in the presence of a spore suspension. No variety proved immune, but Arran Victory, Arran Banner, Great Scot and Arran Chief showed a high degree of resistance. A few varieties, including Golden Wonder and Dunbar Standard, proved less susceptible in the abrasion test than after inoculation; although the inner tissues are susceptible to dry rot, the skin resists a certain amount of damage and thus the pathogen cannot become established. Where such mechanical resistance operates both methods of assessing varietal reaction are advocated.

464 Boyd, A. E. W.
Dry-rot disease of the potato. VII. The effect of storage temperature upon subsequent susceptibility of tubers.
Ann. Appl. Biol. 1952 : **39** : 351–57.

Using varieties differing in degree of resistance to *Fusarium caeruleum* (cf. Abst. 463) it has been shown that susceptibility of all varieties increased with rising storage temperatures. At 39° F a considerable reduction in susceptibility was observed.

465 Mai, W. F. and Peterson, L. C.
Resistance of *Solanum Ballsii* and *Solanum sucrense* to the golden nematode, *Heterodera rostochiensis*, Wollenweber.
Science 1952 : **116** : 224–25.

In tests carried out by the Department of Plant Pathology, Cornell University, NY, the above species have shown resistance. Some evidence has been obtained that *S. sucrense* crosses fairly readily with standard potato varieties. Inbred seedlings of this species have exhibited variation with respect to nematode resistance. Further purification of the inbred strains for resistance is to be attempted, prior to their use in breeding.

466 Montaldo B., A.
Producción de semilla de papa. (**Production of seed potatoes**).
Agricultura Téc., Santiago 1950 : **10** : 32–42.

An account is given of measures taken in Chile to produce healthy planting material and of the varieties grown. These include two clonal selections of the popular Chilean variety Corahila, both superior in yield and one of them less subject to attack by *Heterodera marioni*.

467 *Toxopeus, H. J.
Verslag over de resultaten van het onderzoek naar de mogelijkheden van het kweken van aardappelrassen, die niet door de Coloradokever worden aangestast. September 1949—September 1950. (**Report on the results of research on the possibilities of breeding potato varieties that are not attacked by the Colorado beetle. September 1949—September 1950**).
Pp. 11. (Mimeographed).

These investigations were carried out in collaboration with the Plant Diseases Service, the University of Amsterdam and the Foundation for Plant Breeding.

---

* An abridged translation of this paper is on file at the Bureau.

At Amsterdam University, research on animal and plant physiology was conducted with reference to the nature of resistance.

The chief aim is the breeding of a potato which is not attacked by the Colorado beetle, or to such a slight extent, that no injury is done. An extensive and detailed preliminary report is set out on the resistance or susceptibility of a large amount of experimental material from crosses between *Solanum tuberosum* and *S. demissum* and also from some crosses of the domestic potato with *S. chacoense*.

Some resistant (*S. demissum* x *S. tuberosum*) x *S. tuberosum* seedlings without stolons and with well-shaped tubers were obtained. Of the (*S. demissum* x *S. Antipoviczii*) x Matador seedlings none showed any resistance worth considering. A high degree of resistance was, however, observed in seedlings from uncontrolled pollination from a parent raised by Torka and derived from crosses between very resistant *demissum* material, *S. chacoense* and a domestic variety. Thirty F_1 hybrids of resistant *S. demissum* x *S. chacoense* forms also proved resistant.

Results obtained have been promising and work with a wider range of domestic varieties is contemplated.

468 *TOXOPEUS, H. J.
Verslag van de resultaten van het onderzoek op resistentie tegen de Coloradokever in 1951. (**Report on the results of the investigation on resistance to Colorado beetle in 1951**). Pp. 7. (Mimeographed).

This progress report on Colorado beetle resistance in progenies from crosses of *Solanum demissum* with *S. tuberosum* and of *S. demissum* with *S. chacoense* also discusses the best methods of testing for resistance and its physiological basis.

Among 350 *S. demissum* x *S. tuberosum* progenies, hybrids with D 42 as one parent seemed to include a preponderance of resistant forms, and the cross 42·6 x Voran in particular contained many good plants. Back crosses made in 1952 will be used for research on *Phytophthora* resistance as well.

Eight plants, specially resistant to Colorado beetle, were found among seedlings of DCT 14 x Record, in spite of the fact that, according to Torka's findings, resistance, which is derived from the *S. chacoense* parent, is recessive. Possibly tetraploid inheritance may explain the anomaly.

469 Verslag van de vergadering van de werkgroep voor het onderzoek naar de resistentie van Solanumsoorten ten opzichte van de Coloradokever. 9 December 1948—1 Februari 1950. (**Report of the meeting of the team for research on the resistance of *Solanum* species to Colorado beetle. 9 Dec. 1948—1 Feb. 1950**). Pp. 35. (Mimeographed).

This first report of the research team established in the Netherlands to study Colorado beetle resistance in the potato has been compiled from the following sources: minutes of meetings of the team; papers read by H. J. Toxopeus, de Wilde (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 1896), de Wit and C. Mastenbroek on various occasions; Chin Chun-Teh's dissertation on the physiology of resistance; and Black and Driver's report on relevant research in postwar Germany (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1426). The report treats the Colorado beetle problem from the following aspects: the plant and parasite reactions underlying resistance, including the technique for the determination of the demissin content of *Solanum demissum* and its hybrids; the method of testing for resistance; and the preliminary stages in the breeding programme, involving crosses between domestic and wild species of potatoes (cf. Absts 467 and 468).

470 ROLAND, G.
Étude virologique sur la pomme de terre. Recherches symptomatologiques et histopathologiques. (**A study of viruses in the potato. Investigations on symptoms and histopathology**).
CR Rech. Inst. Encouragement Rech. Sci. Industr. Agric. 1952 : No. 7 : Pp. 118.

Among other information, this report contains tabulated results of the reactions of 76 varieties of potatoes to viruses X, Y and A.

471 GANGULY, A.
The potato and the virus diseases.
Sci. and Cult. 1951 : **16** : 348–52.

The author mentions that, in the diploid *Solanum* forms ($2n = 24$) he has examined, hypersensitive reactions to viruses X, A, C and Y are determined by single dominant genes. The inheritance of these genes is disomic; thus no support is given to Choudhuri's suggestion that inheritance in the diploid forms is tetrasomic (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 37). Evidence has been obtained of strong linkage in the repulsion phase between N_x and N_a and of linkage in the coupling phase between N_a, N_y and N_c.

---

* An abbreviated translation of this paper is on file at this Bureau.

472 Rigot, N.
Étude du comportement de dix-neuf variétés de pommes de terre dans les essais comparatifs de rendement. (**A study of the performance of 19 varieties of potatoes in comparative yield trials**).
Ann. Gembl. 1952 : **58** : 149–62.

Special attention was paid in this investigation to resistance to virus diseases, and a classification of 19 varieties on the basis of susceptibility to leaf roll showed the following varieties, arranged in increasing order of susceptibility, to be relatively resistant: Aquila, Geelbloom [Yellow Flower], Saskia, Noordstar [North Star] and Sirtema. The varieties Urgenta and Frühmölle were classed as moderately susceptible to leaf roll, but showed no mosaic infection.

473 Hutton, E. M. and Wark, D. C.
A relationship between immunity and localized reaction to virus X in the potato (*Solanum tuberosum*).
Aust. J. Sci. Res. Ser. B. 1952 : **5** : 237–43.

Mode of reaction to a strain of virus X cultured in *Datura Stramonium* was determined at Canberra by inoculating the following: an immune potato, 11–84; a susceptible variety, Factor; two varieties, Epicure and 47–20, which give localized necrotic lesions; and F_1 hybrids between all four varieties in all possible combinations. Degree of infection was measured by *Gomphrena globosa* indicators. Results indicate that immunity is not absolute, but depends on an efficient inactivating system which inhibits virus development soon after infection occurs. There is evidence that the degree of inactivation is determined by different combinations of allelomorphs of a major gene which exists in a tetraploid condition. The quadruplex state consisting of four dominant allelomorphs conditions complete susceptibility, whereas the nulliplex condition results in immunity; simplex and duplex states give rise to phenotypes with localized reaction, showing two distinct levels of efficiency, while severe systemic necrosis results from the triplex condition.

474 Simpson, G. W., Bonde, R., Merriam, D., Akeley, D. F., Manzer, F. E. and Hovey, C. L.
Procedure in field testing potato seedlings for leafroll resistance.
Bull. Me. Agric. Exp. Sta. 1952 : No. 502 : Pp. 14.

A technique for determining the reaction of potato seedlings on a large scale is described. In the glasshouse, *Myzus persicae* aphids are bred on rutabaga and transferred to potatoes infected with leaf roll virus so that they become vectors. A small piece of aphid-bearing leaf tissue is then inserted among partly expanded leaves of young seedlings in the field; as the tissue withers the aphids transfer to the test plant. Thus every plant becomes infested with comparative ease and speed.

Many of the first progenies of crosses made at Beltsville, Md., proved susceptible in aphid tests at the Aroostook Farm, Me., but when survivors were used as parents the percentage of survival increased. Using this technique seedlings showing a higher degree of field resistance than Katahdin have been selected.

475 Johansen, R. and Schultz, J. H.
Potato variety trials in North Dakota in 1951.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1952 : **14** : 113–16.

Kennebec, Cherokee and Red Pontiac gave superior yields at each of six trial centres. A local selection, ND 457, was outstanding with respect to specific gravity determinations and has maintained field resistance to virus Y.

476 Tedin, O., and Gelin, O. E. V.
Kombinerade sort- och mangangödslingsförsök i havre och potatis. (**Combined variety and manganese manuring trials with oats and potatoes**).
K. LandtbrAkad. Handl., Stockh. 1952 : **91** : 158–78.

In oats sensitivity to Mn deficiency showed similar varietal differences to those found by Åkerman, but exceptions suggest that external conditions may exert a marked influence on susceptibility.

Though the data are inadequate, there are some indications also of differences in tolerance of Mn deficiency in potato varieties.

477 Michael, R. and Smith, P. G.
Stimulation of sweet potato sprout production.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 414–20.

Eight varieties grown at Davis, Calif., showed marked differential response to six treatments devised to break tuber dormancy and increase the number of sprouts available for vegetative propagation. Ethylene chlorohydrin vapour gave the most promising results without injuring the tubers. Data indicate that the degree of stimulation is inversely proportional to the natural sprouting capacity of a variety.

478 SUGAWARA, T.
Studies on the progeny of the fasciated sweet potato.
Ikushu-kenkyu (Researches of Plant Breeding) 1950 : **4** : 75–79.
[from Rec. Res. Fac. Agric. Univ. Tokyo 1950–1951 (1952) : No. 1 : p. 3. (Abst.)].

A fasciated strain of the variety Norin 4 [Ministry of Agriculture and Forestry 4] produces tubers which are little inferior to the normal variety and which can be gathered more easily.

479 POOLE, C. F.
Seedling improvement in sweet potato.
Tech. Bull. Univ. Hawaii Agric. Exp. Sta. 1952 : No. 17 : Pp. 16.

The high degree of self sterility among seedlings has confined genetical studies at the Hawaii Agricultural Experiment Station to open-pollinated progenies. Segregation ratios for characteristics of HES 48, the female parent of some 350 open-pollinated seedlings, resembled simple Mendelian back cross ratios obtainable with a homozygous recessive female parent. It is hoped that more conclusive data will soon be available, using a self-fertile segregate, designated HES 106–c, which appeared among progenies of HES 48 selected for two generations for high seed yield and prolonged flowering period at 60 ft. above sea level. Although flowering is less frequent at 60 ft. than at 600 ft., continued selection has significantly increased the tendency to flower at low altitudes. HES 8, a seedling selection which has yielded more tubers than any other clone in recent trials, flowers only sparsely even at 600 ft.; its use for breeding purposes is therefore restricted as yet. Particular attention is drawn to the release of Onolena (HES 14), a sweet variety with attractive moist yellow flesh well-suited to baking. Onolena was derived from Nancy Hall x Porto Rico and has inherited the good storing quality of Porto Rico; it gives high yields of marketable tubers at a wide range of altitudes.

480 GUILBEAU, S., MIKELL, J. J. and MILLER, J. C.
A study of the inheritance of *Fusarium* wilt resistance in sweet potatoes.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 107–08.

Some evidence has been obtained at the Louisiana Experiment Station, Baton Rouge, that resistance to *Fusarium* wilt is inherited as a multiple recessive character.

481 HUGHES, M. B. and AYCOCK, R.
Sweet potato clones resistant to internal cork.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 433–38.

At the Edisto Experiment Station, Blackville, SC, clones of Porto Rico developed corky tubers after core-grafting and vector transmission of the virus, whereas six promising lines designated E 7, 11–20, 11–146, 262–33, B 5999 and Allgold, obtained from breeding programmes in different states, showed little or no internal cork. All clones with a high degree of resistance, except Allgold, are closely related to two clones capable of carrying the internal cork virus without developing corky symptoms (cf. Abst. 482). It is therefore probable that this form of resistance is heritable.

482 AYCOCK, R. and HUGHES, M. B.
Sweet potato clones whose roots serve as symptomless carriers of internal cork virus.
Phytopathology 1952 : **42** : 428–30.

Although the two clones 32–149 (Yellow Yam x Nancy Hall) and 3–6, an open-pollinated derivative of 32–149, have both shown marked ring spotting on their leaves when grown adjacent to Porto Rico plants infected with internal cork virus at the Edisto Experiment Station, Blackville, SC, neither has produced corky roots. The internal cork virus was, however, transmitted from 32–149 and 3–6 to virus free Porto Rico by grafting. The virus is therefore carried without corky symptoms by both types; the close relationship of 32–149 and 3–6 suggests that this characteristic is inherited.

483 NIELSEN, L. W.
Internal cork of sweet potatoes. Production of corky lesions in core-grafted roots.
Plant Dis. Reptr 1952 : **36** : 132–34.

The varieties and selections studied showed three types of reaction when the roots were inoculated with internal cork virus by core grafting: some developed typical internal cork root lesions, e.g. Porto Rico; some were symptomless carriers, while others (L–240 and HM 15) appeared to be resistant. In the field, the foliage of L–240 showed chlorotic spots and vein clearing with some red pigmentation; HM 15 had no apparent foliage symptoms. The cork virus was not recovered from either of these selections. Possibly the root and foliage symptoms are caused by different agents.

FIBRES

484 **(New varieties of cotton).**
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. **7** : p. 64. [Russian].

At the Fergana Research Breeding Station, varieties 108–f and 142–f have been developed. The former is notable for its earliness, and the latter, for preharvest shedding of its leaves, which hastens the opening of the bolls, and a compact habit which facilitates combine harvesting. Varieties bred at the Central Cotton Breeding Station, Taškent, include the productive and early C–1470, bearing 30 large bolls per plant. They weigh 7–8 grm. each. At the Vorošilov Collective Farm, Uzbek SSR, a promising variety with fasciated capsules has been obtained, while at the Turkmenian Cotton Research Station, 5904–1, which is productive and yields fine quality fibre, has been developed.

485 **Cotton improvement conference.**
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 179–80.

Simpson, D. M. and Duncan, E. N. Selecting for single properties. (p. 179).

Selfed progenies of two lines which had been selected for a considerable time and of two lines of recent hybrid origin were selected for four years for high and low values of seed and fibre properties; selection for only one property was carried out within a single progeny group. Progenies derived from the first two lines did not give segregates showing any marked difference from the parental mean. In all four lines the properties were quite stable after five generations of selfing. After three or four generations of selfing the marked individual plant variations observed in all progenies were largely nongenetic. The data from the two lines which had been inbred for a long time provided no evidence of major mutations or the cumulative effect of minor mutations involving modifiers.

Loffredo, M. S. A preliminary report on the morphogenesis of storm resistance in cotton. (p. 180).

As a result of an anatomical and morphological study of Stormproof 1, several factors involved in the character of storm resistance are listed.

Johnson, B. Latest mill run test with new strains of cotton. (p. 180).

Commercial spinning tests of Hopi Acala in 1951 have indicated that this variety is generally superior to current commercial varieties in yarn strength, ends down during spinning, strength of plied yarns, strength of fabric and other properties; tests of its agronomic suitability are required.

486 Lewis, C. F. and McFarland, E. F.
The transmission of marker genes in intraspecific backcrosses of *Gossypium hirsutum* L.
Genetics 1952 : **37** : 351–58.

In order to determine whether the selective elimination of the nonrecurrent genotype observed in interspecific backcrosses involving *G. hirsutum* and *G. barbadense* (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 394) was specific to the particular marker genes used, similar marker genes have been studied at the Texas Agricultural Experiment Station in crosses between SL 7–9, Pubescent and Deltapine 14, all varieties derived from one species only. Although the three types differ by many genes other than the six markers controlling colour of plant body, petal spot, lint colour, naked or fuzzy seed and shape and pubescence of leaves, there were no genic or structural interferences with the random recombination of the six qualitative alleles; all allelic combinations proved equally viable. The deficiency of the petal spot allele R_2^{AF} in back crosses to Deltapine 14 was probably due to weak expression rather than to elimination of the gene.

Since neither the marker genes nor the *G. hirsutum* line can have been responsible for the disturbed ratios previously reported in interspecific crosses, it is assumed that selective elimination was caused by genic or structural differences between chromosomes of differing species.

487 Brown, M. S. and Menzel, M. Y.
Polygenomic hybrids in *Gossypium*. I. Cytology of hexaploids, pentaploids and hexaploid combinations.
Genetics 1952 : **37** : 242–63.

A report is given of observations on the breeding behaviour and cytology of interspecific hexaploids produced by doubling the chromosome number of triploid hybrids by colchicine treatment and in two cases by spontaneous doubling, pentaploids and trispecific hexaploid combinations. Each of the original hexaploids consisted of a doubled hybrid of *G. hirsutum* and a cultivated or wild diploid species. The pentaploids were derived from crosses of hexaploids with *G. hirsutum*. By means of these polygenomic hybrids it has been possible to study directly the cytological affinity of each genome with every other genome in *Gossypium*. The relationships established are in general agreement with those previously suggested by other investigators and summarized by Hutchinson *et al.* (cf. *Plant Breeding Abstracts*, Vol. XVIII, p. 183). Whatever their nature, crossing barriers between certain diploid species have been overcome in the hexaploid combinations, all crosses between hexaploids being easily effected. The hybrids thus produced included several combinations of diploid genomes which have not been previously reported: A_1D_5, B_1C_1, A_1E_1, $D_{2-1}E_1$, D_5E_1, D_5C_1 and C_1E_1. They also include combinations of genomes whose meiotic behaviour has not been previously studied because the direct hybrids die at too young a stage (D_1E_1 and B_1E_1). The most important result has been the observation that at least some chiasmata may be formed between the chromosomes of any two genomes, even between the most distantly related genomes. It may therefore be assumed that exchange of chromatin is cytologically possible among all genome groups, even though the exchange in many cases may be limited to parts of only a few chromosomes of the complement; but the interspecific transfer of chromatin is of course limited by the degree of fertility and other factors.

488 MIÈGE, E.
L'avenir de la culture du cotonnier en Afrique du Nord et spécialement au Maroc.
(The future of cotton cultivation in north Africa and especially Morocco).
Rev. Int. Bot. Appl. 1952 : **32** : 235–53.

The historical introduction to this paper contains notes on the identity and origin of some of the cottons in Algeria, Tunis and Morocco (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2838).

489 BYSTRAJA, M. F.
(Supplementary pollination of cotton).
Agrobiologija (Agrobiology) 1952 : No. **3** : 34–38. [Russian].

At the Azerbaĭdžan Scientific Research Institute of Cotton, Kirovabad, the varieties 1363 and 1298 were each emasculated, isolated and pollinated, first with the pollen of the *Gossypium barbadense* variety M–78, and then, 30–60 minutes later, with the mixed pollen of two *G. hirsutum* varieties. M–78 was recognizable by its green leaf and cream lint and the *hirsutum* varieties for red leaf and brown lint respectively. Analyses of the F_1 and later generations showed that some hybrids combined the characters of two or all three varieties supplying the pollen. Segregation in respect of the characters of the pollen-bearing varieties was more extensive in the F_3 than in the earlier generations.

490 ARUTJUNOVA, L. G.
(Heritable changes in cotton caused by the pollen of other genera).
Agrobiologija (Agrobiology) 1952 : No. **3** : 26–23. [Russian].

At the USSR Scientific Research Institute of Cotton, Taškent, the effects of pollination with pollen mixtures, containing the pollen of *Hibiscus* and *Malva neglecta*, upon fertilization and inheritance of *Gossypium hirsutum* varieties S–3210 and 108–f were investigated. It was found that the pollen of *Malva*, and to an even higher degree *Hibiscus*, stimulated fertilization. The F_1 and F_2 from S–3210 x 1 part self pollen + 20 parts *Hibiscus* pollen and the F_1 and F_2 from 108–f x 1 part self pollen + 20 parts *Hibiscus* pollen showed heritable changes involving economic characters. In S–3210 these comprised an increased size of boll and a higher ginning percentage, and in 108–f improved ginning percentage while maintaining the large size of the boll and early maturity.

Changes in inheritance were also observed in these varieties when pollinated with 1 part self pollen and 10 parts each of *Hibiscus* and *M. neglecta* pollen, but no morphological changes occurred in either variety when pollinated with self pollen + *M. neglecta* pollen. However, plants obtained by the latter method were more productive than the controls.

Experiments on fixing the desirable new characters of S–3210 and 108–f by varied seed treatments showed promise.

491 NAYAR, K. V. N.
A rapid method for determining the staple length of cottons.
Indian Cott. Gr. Rev. 1952 : **6** : 82–89.

By measuring the thickness of a tuft of parallel fibres at intervals of ⅛ inch from the aligned end, the number of fibres in the cross section of the tuft at any point can be calculated, thus giving the mean fibre length. The technique takes less time than other methods used to assess selections.

492 Jones, D. L. and Ray, L. L.
Stormproof cotton cuts harvest costs.
Crops & Soils 1952 : **4** : No. 9 : 12–13.

A brief review is given of the development in Texas of varieties whose bolls fail to open fully so that the cotton may be harvested mechanically with negligible loss.

493 Nazir Ahmad, Mohammad Afzal and Ghani, M. A.
Studies on cotton jassid (*Empoasca devastans*) Distant in the Punjab. XII. Apparatus for measuring the toughness of leaf-veins of cotton.
Pakist. J. Sci. 1950 : **2** : 117–20.

A method for recording small variations in the toughness of the cuticle of the leaf vein is described. It has been used successfully to demonstrate that leaf veins of jassid resistant 4F are significantly tougher than those of the more susceptible Victory.

494 Balasubramanian, R.
The Cauvery delta can solve cotton shortage.
Indian Cott. Gr. Rev. 1952 : **6** : 70–75.

Preliminary trials of deep-rooted cotton varieties in irrigated paddy fields of the Tanjore district of Madras, which otherwise lie fallow from December until August, indicate that good yields can be produced by short duration cotton varieties without interfering with the cultivation of surface-rooting rice. An improved variety of *Gossypium hirsutum* from the Punjab, designated 216 F, is very promising as it matures only 4½ months after sowing.

495 **Botany of flax.**
Nature, Lond. 1952 : **170** : 557–59.

Summaries are given of papers read at the meeting on flax held in Belfast in September 1952 by the Botany Section of the British Association. G. O. Searle outlined the history of flax breeding in Northern Ireland, and in referring to future improvement spoke of the importance of the study of the correlations of yarn quality with straw and fibre properties, carried out in recent years by the Linen Industry Research Association. A. E. Muskett dealt with problems of seed health. J. Colhoun presented a paper by A. G. Arif on physiological specialization of *Melampsora Lini*. So far 16 races have been identified. The Russian fibre varieties Textilshchik [Tekstiljščik], USSR 2, 1288/12 and Stakhonevets [Stahanovec] and the Australian flax Wada have proved immune from all the British races; material for the introduction of rust resistance into the susceptible British fibre varieties is therefore available.

496 Flor, H. H.
Flax rust in North Dakota 1948-1951.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1952 : **14** : 161–64.

Data on the occurrence of *Melampsora Lini* are presented showing that dominant races unable to attack a newly introduced flax variety are superseded by races to which the new variety is susceptible; as the variety becomes widely grown the distribution of these pathogenic races also increases.

497 Nickl-Navratil, H.
Erfahrungen bei der Zucht anthraknose-resistenter Flachsstämme. (**Experience in the breeding of flax strains resistant to seedling blight**).
Züchter 1952 : **22** : 228–32.

By artificial infection of flax seedlings with spore suspensions from pure cultures of *Colletotrichum Lini*, it was possible to isolate flax strains that were resistant to seedling blight. No completely resistant linseeds were found. Continued artificial infection with *C. Lini* induces variation in the plants and may even on occasion be followed by mutagenic effects.

The occurrence in Czechoslovakia of different races of *Colletotrichum* and of *Vermicularia* is noted.

The 23 flax strains and varieties used in the experiment are listed, including the following of superior quality: Jugoslav winter flax A 213/20 and Chinese fibre flax A 214/21, which probably carry a recessive factor for *Colletotrichum* resistance and should be crossed with high grade Czechoslovak flaxes and linseeds to combine quality and seedling blight resistance.

498 Zucchini, M.
Canapicoltura ferrarese. Studi e ricerche. (**Hemp growing in the province of Ferrara. Studies and research**).
Riv. Canapa 1952 : No. 2 : 79–83.

Mention is made of experiments in progress in Italy on the treatment of the seeds and the growing points of hemp seedlings with colchicine to obtain polyploid forms. Vernalization, photoperiodism and possible factors affecting sex are also being studied.

499 SENGBUSCH, R. V.
Ein weiterer Beitrag zur Vererbung des Geschlechts bei Hanf als Grundlage für die Züchtung eines monözischen Hanfes. **(A further contribution to the inheritance of sex in hemp as a basis for breeding a monecious hemp).**
Z. Pflanzenz. 1952 : **31** : 319–38.

Monecious and male plants with female habit, when grown in winter in the greenhouse, bore exclusively female flowers, whereas by removing the flowers from diecious females they were induced to form male flowers. The genetical experiments were therefore carried out in as nearly as possible uniform conditions.

Crosses of diecious females with monecious plants with female habit gave almost entirely females. These heterozygous diecious females, when crossed with monecious, gave some 50% monecious with female habit. Diecious females, heterozygous females and monecious plants with female habit crossed with diecious males gave 50% females and 50% males, showing that the XY character of the male plants is unaffected by the sex realizers or the environment. It was not possible to decide from the experimental results whether the realizer for moneciousness was in the X chromosome or the autosomes.

Monecious hemp often gave rise to monecious plants of the male habit, and these so-called lax plants, with longer internodes, occasionally gave rise to plants of the same habit bearing pure female or pure male flowers. A vegetative mutation was observed in a diecious female plant, which bore a pure male section at the tip, ascribed to the loss of the whole or a part of the X chromosome.

The differences between the author's results and those of Hoffmann (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 401) are thought to be ascribable partly to the fact that Hoffmann's male plants were not necessarily all genetically pure male. It is not considered possible for male plants with male habit to arise from monecious material except by cross pollination from diecious males. For this reason it is important that monecious material be spatially isolated from all male plants, and that any males that appear amongst it be rigorously removed. For practical purposes, a population with a high proportion of female plants is preferred to a pure monecious population, because of the risk of inbreeding depression, and such a population is being created by crossing the monecious with a female diecious form. By crossing and backcrossing with Italian and Turkish hemps it is hoped to produce monecious forms of these types too; these crosses have not produced a number of plants with male tendencies as predicted by Hoffmann. Further experiments are being made to increase the fibre content of monecious hemp by crossing it with Bredemann's high-fibre varieties.

500 BONISCONTI, V. and BANDUCCO, E.
Accertamenti sul peso unitario e sul contenuto in olio dei semi della canapa. **(Determinations of the unit weight and the oil content of hemp seeds).**
Riv. Canapa 1951 : No. 1 : 26–32.

Seed from four races, Microsperma, Mesosperma, Pinnatofidofilla and Ipocotile verde [Green Hypocotyl] derived from Carmagnola hemp was analysed. The 1000 seed weight for the four races showed a maximum of 28·135 g., with an average of 21·2 g. Though a genetic character, the 1000 seed weight was markedly affected by environment. This effect was also evident in regard to the oil content in the dry matter of the seeds; the percentage in Microsperma varied between 26 and 35%, while for all four races the means lay between 31·229 and 31·760. No significant correlation was found between 1000 seed weight and oil content of the seed in the races tested.

501 DATTA, R. M.
Meiosis in *Corchorus capsularis* Linn.
Sci. & Cult. 1952 : **17** : p. 523.

Attention is drawn to the frequent occurrence of unreduced gametes in *C. capsularis*. A similar observation has already been reported by Bhaduri and Chakravorti for *C. olitorius* (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 2697). The natural occurrence of triploids is therefore possible.

502 PATE, J. B.
Preliminary reports of some of the disease and pest problems of kenaf, *Hibiscus cannabinus* L., in south Florida. VI. Potential sources of disease resistance.
Plant Dis. Reptr 1952 : **36** : p. 126.

Some ornamental forms of *Hibiscus* are highly resistant to nematodes and *Fusarium* wilt; a strain of *H. Sabdariffa* from French Equatorial Africa has exhibited considerable resistance to nematodes but susceptibility to wilt. Several possible sources of resistance to a virus-like condition are available but require further evaluation before resistant types can be selected.

503 KUWADA, H.
(On the fertility of glutinous hemp).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 239–41. [Japanese].

Studies on the number of seeds per pod have been made in advanced generations of amphidiploid *Abelmoschus esculentus* x *A. Manihot.* Seed number rose from an initial value of 29·2 to a constant value *ca.* 40.

504 CHAUDHURI, S. D. and AMINUL ISLAM, M.
A comparative study of kenaf (*Hibiscus cannabinus* Linn.) and altissima (*Hibiscus sabdariffa* var. *altissima*).
Pakist. J. Sci. 1951 : **3** : 124–31.

In yield trials at the Dacca Agricultural Research Station, East Bengal, three locally developed varieties of *H. Sabdariffa* var. *altissima*, designated D–288, Narsingdhi–1 and Narsingdhi–2, proved superior to the variety Cuba of *H. cannabinus* imported from Canada. Fibre yield showed significant and positive correlation with plant height and basal diameter of the plant in both species. Two months after seedlings became established Cuba appeared to be more susceptible to white mite attack than the three varieties of *H. Sabdariffa* var. *altissima* and thus its initial vigour was considerably reduced.

505 BREDEMANN, G.
Untersuchungen über die Beeinflussung des Fasergehalts der Pfropfreiser bei wechselseitiger Pfropfung faserarmer und faserreicher Nesseln (*Urtica dioica* L.). **[Investigations on the influence on the fibre content of the scion of grafting nettles (*U. dioica* L.) of respectively high and low fibre content].**
Ber. dtsch. bot. Ges. 1952 : **65** : 145–54.

Full details of the experiments and the methods of calculating the statistical significance of the results are given. A reduction of fibre content resulted when a high-fibre variety was grafted on a low-fibre variety, and an increase in the reverse grafts; the degree of change was roughly proportional to the difference in fibre content between the two partners, though some varieties exerted less influence than others and at least one produced a negative effect.

506 MENDES, E. J. and RIJO, L.
A new interpretation for "cytomixis."
Portug. Acta Biol. 1951 : **3** : 211–18.

During meiotic studies within the genus *Aloe*, strands of chromatin were observed between adjacent pollen mother cells formed by *A.* aff. *supralaevis* ($2n = 14$) obtained from the Lisbon Botanical Gardens. These internucleic connexions presumably result from chromatinic agglutination during anaphase in the mitotic division immediately preceding reductional division in the pollen mother cells; the intervening wall formed after anaphase fails to isolate the nuclei completely. At the beginning of meiosis, therefore, one cell may possess additional chromatin and the other may show a corresponding deficiency. Where the abnormality is extensive, meiosis is inhibited and nuclei degenerate. On the other hand, when only one chromosome or chromosomal fragment is concerned, meiosis may continue, giving rise to gametes showing chromosome deficiencies and occasional gametes with duplicated chromosomes derived from threads which have become detached from the cell wall and subsequently included with the chromosomes of dividing nuclei.

SUGAR AND STARCH PLANTS

507 BUZACOTT, J. H.
Varietal changes in the Burdekin district. Nineteenth Conference Townsville, Queensland, from 17th to 23rd April, 1952.
Proc. Qd. Soc. Sug. Cane Technol. 1952 : 155–59.

Changes in the relative importance and popularity of sugar cane varieties from 1934 to 1951 are surveyed. Badila was still the major variety in 1950, but as it was consistently outyielded by Trojan in local trials it was superseded by the latter in 1951. Immediate increases in acreage of Pindar and Trojan are expected.

508 **N : Co. 293 distribution. First new season plant cane.**
S. Afr. Sug. J. 1952 : **36** : p. 305.

The new sugar cane N : Co. 293 (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2876) has been released to growers for high altitudes in South Africa; it has outyielded other canes in trials at Eshowe, but flowers excessively in low coastal districts.

509 **New variety, Q 58.**
Aust. Sug. J. 1952 : **44** : p. 195.

Development of a new sugar cane, Q 58, is reported by the Bureau of Sugar Experiment

Stations, Queensland. It has performed satisfactorily in the Mackay district, in some trials outyielding Q 50 in both cane and sugar per acre. The stool is compact with thin stalks of erect habit.

510 Baver, L. D.
Research in the Hawaiian sugar industry.
Proc. Brit. W. Ind. Sug. Tech. 1951 : 10–15.

A general review of breeding techniques is included (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2098). Special reference is made to "melting pot" crosses in which a mixture of pollen from four or five varieties is used to pollinate selected females. The need for adaptability trials in varied environments at an early stage in the breeding programme is pointed out with reference to 37–1933, which proved particularly suitable for saline irrigated areas but showed little promise elsewhere.

511 Moriya, A.
Sugarcanes in the Far East.
J. Hered. 1952 : **43** : 101–04.

A survey is presented of the kinds of native and wild canes in the Far East and the origins of improved varieties in the Philippines and Formosa. In the latter country most of the improved sugar canes have been produced by crossing Java varieties (*Saccharum officinarum* x *S. spontaneum*) with wild canes from India (*S. Barberi*). It is suggested that better adapted canes for the Far East are most likely to be developed by crossing the primitive *S. officinarum* varieties and indigenous *S. spontaneum* canes in this area, and by further crossing the resulting hybrids with *S. Barberi*.

512 Raghavan, T. S.
Sugarcane x bamboo hybrids.
Nature, Lond. 1952 : **170** : 329–30.

One thin seedling ($2n = 86$) and one thick seedling ($2n = 116$) were obtained from *Saccharum officinarum* variety Vellai ($2n = 80$) x *Bambusa arundinacea* ($2n = 72$). Presumably fertilization of an egg of *S. officinarum*, possessing neither the haploid nor diploid number, with a reduced gamete from bamboo gave rise to the former, whereas fusion of an unreduced egg of *S. officinarum* by a normal gamete of bamboo produced the thick seedling. A preponderance of maternal characters in the hybrids may be due to cytoplasmic inheritance. The results obtained by the author in his work on intergeneric *Saccharum* hybrids lend support to the theory of plasmon-sensitive genes.

513 Cabrera, M. R.
Sunlight and flowering.
Proc. 24 Ann. Conf. Téc. Azuc. Cuba 1950 : 173–78.

Following the discovery that natural shading from the direct sunlight by steep hillsides and tree belts promoted flowering in Badila and Cristalina sugar canes on private farms in Cuba, screens were successfully used to reduce the amount of sunlight received by several varieties at the Varietal Garden of Central Toledo; canes which normally produce inflorescences rarely or sparsely flowered profusely under these conditions, and previously impossible crosses were effected.

Reference is made to the photoperiodic investigations under way in Hawaii to devise means of inhibiting inflorescence development (cf. Abst. 518).

514 Riollano, A.
Paper No. 11/51: Present status of research with sugar cane at the Agricultural Experiment Station of the University of Puerto Rico.
Proc. Brit. W. Ind. Sug. Tech. 1951 : 115–22.

Numerous varieties which have been used as parents in the present programme of hybridization are listed. In trials of promising local selections and introductions, the PR varieties 902, 905, 908, 915, 929, 962, 963, 964, 967, 968 and 1000 and the Barbados canes 34104, 37161, 40105 and 41227 have outyielded commercially grown varieties; several of these PR canes have been derived from crosses involving POJ 2878 or Co. 281.

Experiments are in progress with POJ 2878, MPR 28 and MPR 336 to determine the most effective period of growth for applying light to inhibit the production of inflorescences, and the minimum light intensity necessary for inhibition; with this treatment vegetative growth is maintained and sugar content is increased.

515 Yusuf, N. D.
Methods for inducing flowering and controlling the times of flowering in sugarcane. II. Studies into the effect of nitrogen and water supply on flowering in sugarcane.
Pakist. J. Sci. 1950 : **2** : 71–86.

When numerous varieties, which do not normally flower at Coimbatore and failed to flower after photoperiodic treatment (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 566) were irrigated daily and given a reduced supply of nitrogen, flowering was profuse.

516 HERNÁNDEZ, J. M.
A study of the "Pepe cuca," or "San Agustín" sugar cane variety.
Proc. 24 Ann. Conf. Asoc. Téc. Azuc. Cuba 1950 : 137–45.

Further details are given of the outstanding performance of this variety in Cuba (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2884).

517 STEWART, C. W. and GUILBEAU, W. F.
Evaluation of sugarcane variety C.P. 44-154 for milling and processing.
Sug. Bull. N. Orleans 1952 : **30** : p. 295.

The new cane (cf. Abst. 525) compares favourably with standards at Baton Rouge, La., and its juice shows exceptional clarity.

518 **Report for 1951 of the Experiment Station Committee, Hawaiian Sugar Planters' Association 1951** : Pp. 74.

The possible causes of varietal deterioration are discussed, with special reference to the decline of Q 28 in Queensland (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1218). It is suggested that spontaneous mutation in one of the microorganisms of the environment may be responsible for deterioration. The succession of varieties grown in Hawaii, due mainly to the development of new and improved canes, is surveyed. Varieties used as parents in recent crosses are listed and brief descriptions are given of outstanding seedling selections. Attempts are being made to increase sugar yields by breeding varieties with reduced tendency to flower; the cumulative effect of selection pressure in this direction has resulted in populations with an increasing percentage of canes which flower sparsely.

Results of photoperiodic investigations (cf. Abst. 510) indicate that the production of inflorescences can be inhibited by exposing canes to aluminium or magnesium flares for a minimum of 10 nights; exposures on alternate nights proved effective. Sugar yields can therefore be increased with comparative ease by thus inhibiting flowering; the economic aspects have still to be determined.

At the Samoan substation, numerous Hawaiian canes have been tested for resistance to Fiji disease. Artificial inoculation experiments with virus from diseased clones show that the pathogen can only be transmitted by the sugar cane leafhopper.

Mention is made of the wild *Saccharum* species collected for breeding purposes by the Queensland expedition to New Guinea (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts 568, 570 and 1296); some of this material and seeds from crosses made in Queensland have germinated under quarantine in Hawaii.

519 HSIA, Y. J., CHUAN, L. T. and WANG, C. S.
An appraisal of N: Co. 310 cane. Results of extensive tests on Taiwan.
S. Afr. Sug. J. 1952 : **36** : 287–301, 349–55, 435–43.

Results of adaptability trials carried out at Huwei since 1947 indicate that the South African sugar cane N : Co. 310 (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 561) is the most promising cane yet grown in Taiwan.

520 FORS, A. L.
Description of new sugar cane varieties in Cuba. Part I.
Proc. 24 Ann. Conf. Assoc. Téc. Azuc. Cuba 1950 : 129–35.

An account is given of the relative performance of varieties recently introduced from Puerto Rico. PR 908 (MPR 28 x POJ 2878) is well-suited to local conditions; it ripens early and produces a heavy tonnage of canes with large diameter and high sugar content. Although its ratooning capacity has not yet been investigated in Cuba, PR 908 has been released to planters for trial on different soils.

521 **South African cane on trial. N: Co. 310 tested in Australia.**
S. Afr. Sug. J. 1952 : **36** : p. 303.

The South African sugar cane N : Co. 310 (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 561) has grown vigorously and given high yields in adaptability trials in southern Queensland.

522 SMITH, N. McD.
Some observations on frost injury to sugar cane—Nambour area. Nineteenth Conference, Townsville, Queensland, from 17th to 23rd April, 1952.
Proc. Qd. Soc. Sug. Cane Technol. 1952 : 123–32.

Trojan and Q 42 were more resistant to apical and lateral bud damage and cane rotting than CP 29/116 and Q 47 during a period of severe frost in southeastern Queensland. In subsequent weeks the sucrose content of Trojan and Q 42 fell considerably; this was thought to be correlated with the almost complete leaf chlorosis in both varieties at low temperatures and consequent decrease in photosynthesis. The green-stemmed canes CP 29/116 and Q 47 maintained a high sucrose content in the dry weather which prevailed during and after the period of low temperature, thus limiting the degree of rotting.

523 HUGHES, C. G.
Testing sugar-cane varieties for resistance to leaf-scald disease.
Cane Gr. Quart. Bull. 1952 : **16** : No. 1 : 12–15.

The technique of inoculation adopted in Queensland is described and locally approved varieties are grouped according to their reaction; a high degree of resistance has been shown by Atlas, CP 29–116, Comus, D 1135, Eros, Pindar, POJ 2725 and POJ 2878, Q 50 and Q 813, and Vesta.

524 STEINDL, D. R. L. and SMITH, N. McD.
***Sclerospora* disease.**
Cane Gr. Quart. Bull. 1952 : **16** : No. 1 : 7–9.

Preliminary investigations have shown that under field conditions suitable for the dissemination of the fungal spores all sugar cane varieties grown in the Moreton district, Queensland, are susceptible. Symptoms vary with different varieties but are distinct from those associated with downy mildew.

525 WADLEIGH, C. H., TAGGART, W. G. and BORNE, L. A.
Release of new sugarcane variety C.P. 44-154.
Sug. Bull. N. Orleans 1952 : **30** : p. 294.

CP 44/154 has been officially approved for commercial planting in the western section of the Louisiana sugar belt. It is a vigorous variety which exceeds Co. 290 in total yield and sugar content; it equals CP 36/105 in stalk diameter, but has a lower sucrose content than the latter. The new variety does well on light and heavy soils and possesses satisfactory resistance to local diseases and the cane borer.

526 **Diagnosis of ratoon stunting disease.**
Aust. Sug. J. 1952 : **44** : p. 335.

Further examination of the sugar cane Q 28, which has shown severe stunting of ratoon crops in Queensland, with apparently no other distinctive disease symptoms (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1217 and 1218), has revealed that the presence of orange-coloured vascular bundles in the nodal region of the mature stem is a reliable indication of diseased tissue. Selection of healthy material may therefore be possible.

527 BARRETO, R.
Work done by the sugar cane experiment station in 1950.
Proc. 24 Ann. Conf. Asoc. Téc. Azuc. Cuba 1950 : 165–71.

Numerous crosses between standard Cuban varieties and introductions showing adaptability to local conditions are listed and details are given of the percentage of promising selections; the latter are being tested for reaction to mosaic virus before yield trials continue.

528 **Sugar sorgo research at Houma, Louisiana.**
Sug. Bull. N. Orleans 1952 : **30** : 392, 399.

Some 50 varieties of sweet sorgo (*Sorghum vulgare*), selected during preliminary trials with over 300 strains from different parts of the world at Meridian, Miss., have been undergoing further disease resistance tests at Houma, La. A few have shown a high degree of resistance to leaf anthracnose, rust and zonate leaf spot, three diseases prevalent in Louisiana, but none of these resistant types has acceptable juice quality; they are, however, to be incorporated in the local breeding programme.

529 VISSER, R. H.
Anatomisch-physiologische rasverschillen bij suikerbieten. (**Anatomical and physiological differences between varieties of sugar beets**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 4 December 1951, Wageningen : 425–33. (Mimeographed).

During 1947–50, the speaker carried out studies in various parts of the Netherlands on anatomical leaf characteristics of sugar beet varieties. The present address gives a detailed analysis of his data regarding size and number of the leaf stomata and factors, such as age and drought, that may affect stoma formation. A possible relationship between stoma number, assimilation capacity and high yield is also discussed, as well as the related problem of whether effective selection for yield can be carried out at the seedling stage on the basis of stoma number. From his own observations the writer infers that differences in stoma number are genetically determined.

530 Orlovskiĭ, N. I.
(The effect of environmental training of sugar beet upon the productiveness of the succeeding generation).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1952 : No. 4 : 31–42. [Russian].

At the USSR Sugar Beet Institute heritable changes were obtained in I 1305 E and V 23 N when these varieties were grown for seed under drought conditions. The succeeding generations yielded 30% less roots, when grown on moist soil, than plants grown from seed produced on moist soil.

531 Popov, A. V.
(New methods of improving beet varieties during the breeding process).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 6 : 30–36. [Russian].

The study of selection methods at the Jaltuškovskiĭ Breeding Centre (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2882) has continued. Some productive material was obtained from Ja 476 N and 1481 by continuous selection of suitable types in the first and second year.

532 Schlösser, L. A.
Polyploidie in der Zuckerrübenzüchtung. (**Polyploidy in sugar beet breeding**).
Mitt. dtsch. LandwGes. 1952 : **67** : 551–52.

A brief description is given of the tetraploid sugar beet Kleinwanzlebener Polybeta, which is now on the market. The seed balls are much larger than in diploid strains, the cotyledons are somewhat broader, and the leaves thicker, larger and greener, even in late autumn, in consequence of which they are less damaged by *Cercospora;* the plants are practically free from bolting. The greater root yield of the polyploid is combined with a relatively high sugar content and so leads to a very considerable increase in sugar yield per hectare.

533 Zaĭkovskaja, N. Ė.
(Somatic fertilization in sugar beet).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) Ser. Biol. 1952 : No. 4 : 68–78. [Russian].

Fertilization in sugar beet, after pollination with a large amount of pollen, was investigated at the USSR Institute of Sugar Beet. The staining technique of Ėllengorn and Svetozarova made the male cells appear pink and the female blue or purple. The pollen reached the ovule mainly through the micropyle but sometimes also through the tissues surrounding it. The latter occurred more frequently when a large amount of pollen was available. At first, when the cytoplasm of the egg mingled with that of the male gamete, the two cytoplasms stained differently. Later all the cytoplasm stained a uniform purple. The behaviour of the male nuclei was more difficult to observe. However, the following evidence suggests that a fusion between the male nuclei and the nuclei of the somatic cells occurred: (*a*) putative fertilized somatic cells stained in the same way as fertilized egg cells; (*b*) in the former nuclei, two nucleoli were often observed; and (*c*) the nuclei of the nucellar cells showed no changes when a small amount of pollen was used. Somatic fertilization of the nucellar cells renders the biochemical composition of the perisperm similar to that of the endosperm. The difference between them derives from differences in the proportion of male and female constituents.

534 Ulrich, A.
Variety trials. Sugar beets compared for growth, sugar content in controlled chambers.
Calif. Agric. 1952 : **6** : No. **9** : p. 5.

The results of sugar beet trials conducted in the laboratory under controlled conditions simulating different climates are presented. Although under short day conditions at 79° F both GW 304 and US 22–3 performed equally well, GW 304 significantly outyielded US 22–3 in a cool climate with long days. The root weight of hybrid H 148 was greater than either of its inbred parents in a cool climate, but at higher temperatures the inbreds proved superior; the sugar content of the hybrid, which showed the influence of heterosis in cool conditions, was also reduced in a constant temperature of 79° F with short photoperiods. Thus it appears that hybrid vigour, with respect to sugar content, cannot be exploited by breeders in warm climates with short days.

535 Gaskill, J. O.
A new sugar-beet breeding tool—two seed generations in one year.
Agron. J. 1952 : **44** : p. 338.

An outline is given of photoperiodic treatments devised by the US Division of Sugar Plant Investigations at Fort Collins, Colo., to induce an early transition from the vegetative to the reproductive phase. Two successive generations have been produced within 12 months, thus accelerating breeding; although there is 100% flowering with this treatment, the seed yield is not large.

536 Olah, L.
La fecundación de *"Beta vulgaris"* L. (**Fertilization of *B. vulgaris* L.**).
Rev. Invest. Agric., B. Aires 1950 : **4** : 427–36.

Plants of the sugar beet C 242 and the mangel Eck. MA were planted in pairs and the seed collected from each plant separately. An examination of 1200 F_1 plants from three of the sugar beets showed that only 2·8% of them had arisen from self pollination, the corresponding figure for the mangel progeny being 4·2%. A description is given of the hybrid plants; they were intermediate in most characters, the sugar beet root form being dominant.

The experiment was repeated, planting alternately 18 plants of each variety. In this case the percentage of crossed plants was only 44·54 in the mangel progeny, the rest being selfs or crosses between two plants of the same variety; 92·7% of the sugar beet progeny however were crosses. The sugar beet used thus has a much higher proportion of *S* genes.

537 Hendriksen, A. J. T
Het gebruik van enige correlaties bij de bietenveredeling. (**The employment of some correlations in beet breeding**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 1951 : 414–20. (Mimeographed).

A discussion is presented on the correlations, positive or negative, that subsist between dry matter content, refractometer and polarimeter readings, sugar content, sugar yield, root weight, foliage production and maturation time in sugar and forage beets. The possible usefulness of these correlations for selection purposes is indicated.

538 Mochizuki, A. and Matsumura, S.
(**The value of triploid sugar beet**).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 33–34. [Japanese].

Data are given on the root weight, percentage sugar content, Brix value and sugar yield of diploid, triploid and tetraploid strains of some Japanese sugar beet varieties. The triploids are of special interest on account of their large roots and high sugar yield.

539 Ljaščenko, E.
(**Highly productive varieties of sugar beet**).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 6 : p. 58. [Russian].

Two sugar beet varieties, R–407 and R–632, which yield 77 c. sugar per ha. have been recently developed at the Ramonj Breeding Station. R–632 was selected from R–1537, a variety previously developed at the institute, which was remarkable for its high production and resistance to bolting. R–407 was bred from unspecified material with a high sugar content.

R–632 and R–407 are early, carry resistance to drought, bolting and diseases and show good response to fertilizers and cultivation.

540 Orlovskiĭ, N. I.
(**The effect of environmental training upon the productiveness of sugar beet and of the succeeding generation**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 4 : 60–64. [Russian].

The heritable effects of cultivating varieties I–1305 and V–23 on moist soil and under drought conditions were investigated at the USSR Sugar Beet Scientific Research Institute, Kiev. It was found that material grown in the preceding generation on moist soil yielded more leaves and roots and had a higher sugar content than material from seed produced under drought conditions. The difference in the sugar yield of I–1305 amounted to 25% and that of V–23 to 32%. The differences in the root weights were between 31 and 38%.

The material grown for two generations under drought conditions became more adapted to low moisture supply than sugar beet that had been grown on moist soil.

541 Stewart, D.
The development of *Cercospora* leaf spot resistant monogerm sugar beets.
Phytopathology 1952 : **42** : p. 334. (Abst.).

A *Cercospora* resistant variety producing seeds with several germs was crossed with the leaf spot susceptible SLC 101 in order to combine the single germ character of the latter with leaf spot resistance. Some F_2 segregants with the single germ character, which is inherited as a simple recessive, grew vigorously and produced large seeds. F_3 lines from these vigorous offspring were tested for leaf spot reaction; eight seedlings with a high degree of resistance have been selected for increase.

542 Forsøg med stammer af sukkerroer til fabrik. 1949–1950. **(Trials of strains of sugar beet for manufacture. 1949-50).**
Tidsskr. Planteavl 1952 : **55** : 543–46.

Danish, Swedish and German strains were compared in trials at Lyngby, Tystofte, Abed and Blangstedgaard.

Maribo P, a Danish polyploid strain, gave the highest yield of sugar and of roots per ha. and the sugar content of the roots was also high, but the germination capacity of the seed was low. Two other Danish strains, Adefa 17 and Adefa 45, gave high yields of roots with a low sugar content, but Adefa 17 gave the highest yield of sugar per ha.

543 THOMPSON, E. G.
Trials of sugar beet strains.
Brit. Sug. Beet Rev. 1951 : **21** : 25–28.

The results of former trials (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 594) are brought up to date by the inclusion of data for 1951. German Klein E has again given the highest yield of sugar. The relative performances of the other 13 varieties remain the same except with respect to bolting; Battle's E was less inclined to bolt than German Klein E, which had previously shown the lowest tendency to bolt, and Johnson's Perfection E also showed a marked reduction in bolting.

STIMULANTS

544 Istituto Scientifico Sperimentale per i Tabacchi. Relazione tecnica anno 1951. **(Scientific Research Institute for Tobacco. Technical Report for 1951).**
Tabacco, Roma 1952 : **56** : 131–41.

Selection work has been pursued actively with Virginia Bright, subtropical and oriental tobaccos and their hybrids, and several promising selections are mentioned. Genetical work includes studies on the induction of mutations and polyploids, and of the genetics of enation.

Nicotiana rustica is being studied for high nicotine content. Mosaic-resistant hybrids from Seville and from the USA have been crossed with Italian varieties.

545 BOLSUNOV, I.
What Austria is doing to increase and improve varieties of own leaf.
Tobacco, N.Y. 1952 : **134** : 31, 63, 167.

Tobacco breeding at Fuerstenfeld, East Styria, has been concerned mainly with (*a*) selection from hybrid progenies showing transgression in size and thickness of leaf and number of leaves per plant; (*b*) back-crossing progenies from crosses between spontaneously occurring giant mutants and commercial varieties, using the latter as recurrent parents, thus improving their leaf quality and disease resistance; (*c*) reducing internodal distance by crossing giant tobaccos with dwarf varieties so that the hybrids have comparatively short stalks and therefore tend to resist lodging; (*d*) hybridization between giant types and forms with strong quick-growing roots, to improve resistance to lodging and drought; and (*e*) selection for early maturity, reduction in the number of suckers and resistance to diseases. Some of the newly developed Virginia, cigar and burley tobaccos, which have outyielded well-known varieties by 30–100% for two consecutive years in local field trials, include Virginia Austria, Virginia Colossus, Bolsunov's Virginia, Hercules, Rex, Sphinx and Bolsunov's Big Burley.

546 HITIER, H. and IZARD, C.
Observations sur le comportement caryologique de quelques hybrides de *Nicotiana*. **(Observations on the caryological behaviour of some *Nicotiana* hybrids).**
CR Acad. Sci. Paris 1950 : **230** : 1308–10.

Meiosis is described in the following hybrids: *N. rustica* x *N. Tabacum*, *N. paniculata* x *N. longiflora*, *N. paniculata* x *N. alata*, *N. paniculata* x *N. glutinosa*, *N. glauca* x *N. Sanderae* and (*N. rustica* x *N. suaveolens*) x *N. Sanderae*. In all cases, meiosis was asyndetic and sterility almost complete.

547 HITIER, H. and IZARD, C.
Contribution à l'étude des tumeurs observées sur certains hybrides de *Nicotiana*. **(Contribution to the study of the tumours observed in various *Nicotiana* hybrids).**
CR Acad. Sci. Paris 1951 : **232** : 877–79.

The occurrence of tumours in interspecific *Nicotiana* hybrids is reviewed, also the effect of chromosome duplication in this connexion, and the histology and cytology of the neoplastic tissues.

548 Scarascia, G.-T.
Sviluppo del tappeto dell'antera in *Nicotiana tabacum* var. Bright. **(Development of the tapetum of the anther in *N. Tabacum* var. Bright).**
Tabacco, Roma 1952 : **56** : 195–211.

A caryological study of the tapetal cells in *N. Tabacum* showed that the three or four divisions that occur during prophase of the pollen mother cells are usually completed by the time the latter reach diakinesis. Among the mitotic phenomena described for the tapetum, are (1) endomitosis, (2) mitosis with diplochromosome formation, and (3) the production of octoploid nuclei, associated with endomitosis, anaphase bridges, or lagging chromosomes.

549 Cameron, D. R.
Inheritance in *Nicotiana tabacum.* XXIV. Intraspecific differences in chromosome structure.
Genetics 1952 : **37** : 288–96.

Differences in chromosome structure among 55 varieties of *N. Tabacum* have been analysed; fifteen of these varieties have already been studied by Mallah (*Plant Breeding Abstracts*, Vol. XIV, Abst. 593). The highly inbred variety Purpurea was used as a standard of reference. The results from crosses of the other 54 varieties with Purpurea indicate that the chromosomes of the 25 large-seeded commercial varieties included in the collection are structurally similar to those of *Purpurea.* The remaining 29 varieties, which are characterized by relatively small seeds and weedy growth habit, possess reciprocal translocation complexes. Cytological analysis of hybrids between these 29 varieties and the four tester varieties Huandquina, Apolo Red, Chinchao and Cuba White has revealed the existence of 11 different classes of ring configurations. The identification of all but two of the interchanged chromosomes has been accomplished by means of crosses of monosomics of Purpurea with seven varieties, including the above four testers. In nearly all cases the components of an association belong to the same genome, either the "sylvestris" or "tomentosa" genome. The possible mode of origin of the various translocation complexes from a basic structural type is discussed.

550 Kehr, A. E. and Smith, H. H.
Multiple genome relationships in *Nicotiana.*
Mem. Cornell Agric. Exp. Sta. 1952 : No. 311 : Pp. 19.

Interspecific hybridization between 12 distantly related species from 7 sections of the genus gave rise to 9 F_1 hybrids not previously reported and 15 hybrids already obtained (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 374). Pregerminated seeds of the 24 hybrids were treated with colchicine and 16 amphidiploids were produced, 9 of which had not been reported previously. Details are given of 18 triple genome combinations obtained by crossing an amphidiploid with a third unrelated species; five plants combining genomes of four species were also produced by crossing unrelated amphidiploids or by crossing a trispecies allopolyploid with a fourth species. Plants combining diploid complements of *N. Debneyi*, *N. glauca* and *N. Sanderae* and also of *N. Bigelovii*, *N. Debneyi* and *N. Tabacum* were obtained; the latter ($2n = 144$) combines the complete genomes of species originating from North America, Australia and South America.

Cytological observations made at meiosis in the multiple hybrid *N. Bigelovii-Debneyi-Tabacum* x *N. glutinosa* revealed 3–6 bivalents and some chromosomes connected by bridge-like structures; this suggests the presence of a few chromosomes with homologous segments in three or four species, in spite of their present isolation and evolutionary divergence. Although such genetic homologies remain among *Nicotiana* genomes, the relationships are not sufficiently close to permit heterogenetic association in amphidiploids; differential affinity in both amphidiploids and allopolyploids accounts for their regular meiotic behaviour.

It has been supposed that in most genera a point is reached beyond which there is an inverse relationship between high chromosome number and increased vigour, nevertheless, in the *Nicotiana* allopolyploids there is no evidence of this effect. The availability of sufficiently diverse specific genomes may, however, ultimately limit the development of more complex fertile allopolyploids.

For most characters multiple genome combinations are, like F_1 hybrids, intermediate in phenotype between the two immediate parents. Marked changes in compatibility relationships were however apparent. The amphidiploid *N. Debneyi-Tabacum* crossed readily with *N. alata*, *N. Sanderae* and *N. Langsdorffii*, although both *N. Debneyi* and *N. Tabacum* are incompatible with these species. The range of hybridization may thus be extended beyond that possible at the diploid level, presenting new opportunities for breeders.

551 SANKEWITSCH, E.
Untersuchung von Röntgenomorphosen bei *Nicotiana rustica* L. **(An investigation of morphological changes, due to X irradiation, in *N. rustica* L.).**
Beitr. Biol. Pfl. 1952 : **29** : 1–74.

Dichotomizing of the growing point and subsequent fasciation of leaves and stems and other morphological anomalies following X irradiation of three varieties of *N. rustica* are considered from the standpoint of their histogenesis and developmental physiology.

552 BOLSUNOV, I.
Austria is growing new varieties of nicotine-poor and nicotine-rich leaf.
Tobacco N.Y. 1952 : **135** : No. 5 : 65, 160.

Further details are given of tobacco breeding at Fuerstenfeld, East Styria (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1322 and Vol. XXIII, Abst. 545), where for many years attempts have been made to reduce the nicotine content of cigar varieties without also reducing leaf quality and yielding capacity. In trials during 1950 and 1951, four newly developed varieties, Carmencita, ATAFEG* green, Indiana and Styria, showed a nicotine content varying from 0·3 to 0·7%, compared with an average of 1–2% for the American standards Havana 142 and Connecticut Havana; in 1951 three more new varieties, Torero, Vindobona and Habanera, contained 0·12, 0·07 and 0·18% nicotine, respectively. Carmencita, Torero, ATAFEG and Habanera have outyielded American, French, Italian and Spanish standards. Habanera is particularly notable as it bears twice as many leaves as other cigar tobaccos and has very short internodes.

The breeding station has also been concerned with increasing the nicotine content of varieties of *Nicotiana rustica* grown for nicotine extraction; during 1951 trials three new varieties named Bolsunov 293, Bolsunov 416 and Bolsunov 422 contained 5·07, 6·83 and 8·95% nicotine respectively, whereas the standard Chmelowka [Hmelovka] from the Ukraine contained only 3·77% nicotine.

These promising varieties of *N. Tabacum* and *N. rustica* are undergoing adaptability trials in various parts of Austria.

553 McGREW, J. R.
A preliminary screening of the genus *Nicotiana* for resistance to tobacco anthracnose.
Phytopathology 1952 : **42** : p. 343.

All 14 commercial varieties of tobacco on trial proved susceptible to the species of *Colletotrichum* isolated from typical lesions on tobacco growing in Maryland, but a high degree of resistance was shown by *N. alata, N. Debneyi, N. longiflora, N. Langdsorffii, N. nudicaulis, N. sylvestris* and *N. trigonophylla.*

554 GRAHAM, T. W.
Susceptibility of tobacco species to the root-knot nematode species.
Plant Dis. Reptr 1952 : **36** : 87–88.

Production of egg masses on the roots was found to be the most critical measure of the reaction of *Nicotiana* spp. to five *Meloidogyne* spp. All species attack *Nicotiana Tabacum. N. megalosiphon* was highly resistant to every species.

555 GUTIERREZ, M. E., AGATI, J. and BAYUBAY, S.
Preliminary studies on the reaction of local and newly introduced varieties of tobacco to wilt and mosaic diseases.
Philipp. J. Agric. 1950 (1952) : **15** : 235–48.

Numerous varieties obtained from the US Department of Agriculture have been compared with local strains at Manila, Philippines. Three introductions, 79A, 448 and Oxford 26, proved very resistant to bacterial wilt; single plant selections of the local strains Simmaba 6, Simmaba C, Vizcaya and Havana, showing tolerance of wilt until the end of the growing season, are to undergo further trial. Two American varieties, Ambalema and Ky. 52, showed a high degree of mosaic resistance; Simmaba C, the only local strain with some tolerance of mosaic, was crossed with Ambalema and Ky. 52.

556 KASSANIS, B.
Some effects of high temperature on the susceptibility of plants to infection with viruses.
Ann. Appl. Biol. 1952 : **39** : 358–69.

The susceptibility of *Nicotiana glutinosa* and varieties of *N. Tabacum* and *Phaseolus vulgaris* to five mechanically transmissible viruses producing countable local lesions was considerably increased by keeping the plants at 36° C for some time before inoculation. Exposure to high temperatures after inoculation had an inhibitory effect on virus multiplication.

---

* Austria Tabakeinlöse- und Fermentationsgesellschaft.

557 **Annual Report of the Tea Research Institute of Ceylon for the year 1950.**
1952 : Bull. No. 32 : Pp. 58.

Portsmouth, G. B. Report of the plant physiologist for the year 1950. (pp. 36–40).

Selection of mother bushes and clones for resistance to blister blight continued.

Walter, T. E. Report of the scientific officer, Low-country Sub-station for the year 1950. (pp. 50–51).

Clonal cuttings received from several estates showed very wide range in rooting percentage. In clonal selection, sufficient consideration should therefore be given to the characteristic rooting percentage of any particular clone before large scale propagation is undertaken.

558 RIBEIRO, A. P.
Intensificam-se em Campinas os estudos relativos ao melhoramento do cafeeiro. (**Studies relating to coffee improvement are being intensified at Campinas**).
Bol. Suptda Serv. Café, S. Paulo 1952 : **27** : 426–28.

In this brief account of the work on breeding and genetics of coffee at the Campinas agronomical institute in Brazil, it is mentioned that yield measurements have been made on over 50,000 trees. The yellow Bourbon type has given the highest yields.

559 **Cacao collecting expedition in Colombia.**
Nature, Lond. 1952 : **170** : p. 441.

Information is given on the aims of the expedition organized by the Imperial College of Tropical Agriculture, Trinidad and the Government of Colombia.

560 POSNETTE, A. F.
Plant pests and diseases. Virus research at the West African Cacao Research Institute, Tafo, Gold Coast.
Trop. Agriculture, Trin. 1951 : **28** : 133–42.

Current investigations concerning swollen shoot of cacao are reviewed, special reference being made to the multiplicity of virus strains and their high mutation rate, the possibility of immunizing with relatively mild strains, and the discovery of sources of resistance to the vector (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1342).

561 **Annual Report of the Department of Hop Research, Wye College 1951** : Pp. 79.

General report. (pp. 4–17).

Progress is reported in the work being carried out to combine the aroma of English hops with resistance to *Verticillium* wilt.
The new wilt resistant variety Bramling Cross has been released (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2913).
Variation in wild hops from different parts of the world is under investigation.
Hairs on the upper side of the stem nodes apparently distinguish American hops and are a dominant character.
In meiotic divisions, all three of the males raised from Japanese seeds have shown the chain of four chromosomes described by Japanese workers; chromosome relationships which result in this chain have been analysed.
Work on colchicine-induced polyploidy continued.

Dark, S. O. S. Variability in Canadian wild hops. (pp. 69–71).

No evidence has been obtained that a gene for high resin content or for resistance to *Verticillium* wilt is present as such in wild American varieties; apparently the American and European stocks contain complementary genes which, when brought together in hybrids, result in these useful characters. A number of factors for sterility are evidently segregating in the wild Canadian population under investigation; the sterility is expressed as lack of germinability of well-developed seeds.

Salmon, E. S. The challenge cups for new varieties of hops. (pp. 72–77).

The results of the 1951 competition among growers are presented.

562 NALIVAĬKO, JU. S.
(**The question of increasing the content of resins in the hop**).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V.I. Lenina (Proc. Lenin. Acad. Agric. Sci. USSR) 1952 : No. **7** : 25–28. [Russian].

Mention is made of clone 17 recently developed in the Žitomir province with cones having an appreciably higher content of resins than the local Ukrainian varieties.

MINOR CROP PLANTS

563 LAŠUK, G. I. and SNEGIREV, D. P.
(Breeding and seed growing of lavender).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. **6** : 37–46. [Russian].

Continued vegetative reproduction of lavender clones at the Nikita Botanical Gardens and the Simferopolj Zonal Station of the USSR Institute of Essential Oil Plants has had a deleterious effect upon productiveness. A scheme of selection, involving vegetative reproduction and hybridization of new clones selected for productiveness, is put forward.

564 BALDINI, E.
Note genetiche e pratiche per il miglioramento delle razze di peperone. **(Genetical and practical observations for varietal improvement of pepper).**
Ann. Sper. Agr. 1952 : **6** : 951–73.

Commercial varieties of sweet pepper proved to be exceedingly mixed genetically. Observations on the floral biology have indicated that they are predominantly cross-pollinated but are interfertile, even if belonging to different botanical varieties.

Typical plants of 20 varieties were selfed and intercrossed; the results showed that pendulous fruit habit was dominant to erect, red fruit to yellow and pungent flavour to sweet; in fruit form the hybrids were intermediate between the parents. Red fruit seems to be dependent on two genes, *R* and *Cl*, fruits with *R* alone being brown. The other characters mentioned were monofactorial.

A scheme is propounded for the improvement of varietal purity by line selection and for seed production of the selected varieties.

565 VAZART, J.
A propos de l'existence de grains de pollen polyploïdes chez *Capsicum annuum* L. **(On the existence of polyploid pollen grains in *C. annuum* L.).**
CR Acad. Sci. Paris 1950 : **231** : 1244–45.

Polyploid pollen grains formed by the fusion of two or three of the tetrads resulting from division of the pollen mother cell have been observed. This occurrence is attributed to the low temperatures encountered at Paris; it is not known whether the polyploid grains are capable of effecting fertilization.

566 GREENLEAF, W. H.
Inheritance of pungency and of the deciduous character in peppers (*Capsicum annuum*).
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 110–11.

In the cross Pimiento x Birdseye, pungency was dominant to lack of pungency, and dependent upon a single gene, designated *C*. The deciduous character of the ripe fruits also had monofactorial inheritance (*S*) and was dominant to nondeciduous behaviour.

567 SENJUŠKIN, A. E.
(A new variety of sweet pepper).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : p. 75. [Russian].

D 211 was obtained at the Majak Breeding Station by free pollination between Amerikanskiĭ Želtyĭ 413 [American Yellow 413], Gloria 389 and Bolgarskiĭ 070 [Bulgarian 070].

D 211 has a determinate habit and yields 150 c. mature fruits and 50 c. immature fruits per ha. The fruits are large, pyramidal, smooth and dark green when picked, and bright red when ripe. They have a high vitamin C content, keep well, show good transportability, and are suitable for processing. D 211 carries resistance to fungous and bacterial diseases.

568 TANDON, S. L.
Some physiological aspects of autotetraploidy in *Brassica campestris* L. var. *sarson* Prain.
Sci. & Cult. 1952 : **18** : 40–41.

A tetraploid population raised from open-pollinated seeds of the C_6 generation was compared with a corresponding diploid population as regards growth and morphology. The tetraploid form was distinguished by later flowering and a number of gigas features. Its seed yield was considerably reduced; this reduction was offset by greater seed weight. The tetraploids included 0·70% natural hybrids with *Brassica juncea;* no such hybrids were detected among the diploids. The tetraploid and diploid forms showed similar degrees of natural crossing with toria.

569 ANDERSSON, G.
Svalöfs höstraps och höstrybs, nya erfarenheter. **(Svalöf winter rape and winter turnip rape; recent results).**
Svalöf Katalog för Hösten 1951. Allm. Svenska UtsädesAB. Svalöf 1951 : 6-10.

Following descriptions of the winter turnip rapes Rapido and Lembke's and of the winter rapes Matador and Svalöf Senraps élite B [Svalöf Late rape élite B], a new winter rape Tenus is announced. It has proved superior in winter hardiness, yield, oil content and earliness and is recommended for replacing Svalöf Senraps. The new variety, whose habit and botanical characteristics are described, was obtained by pedigree selection from the Polish rape Wilnensis.

570 Blaringhem, L., Chevet, L. and Rohlfs, L.
Une nouvelle race de ricin (*Ricinus communis* L. var. *pseudoandrogyna*. **[A new variety of castor oil plant (*R. communis* L. var. *pseudoandrogyna*)].**
CR Acad. Sci. Paris 1951 : **233** : 770–74.

The new variety is characterized by having bisexual flowers and an annual habit; it was selected at the Arboretum G. Allord, Angers, Maine-et-Loire.

571 Kobayashi, T.
(Cytological studies on polyploid sesame).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 19–20. [Japanese].

Meiosis was studied in colchicine-induced tetraploids of *Sesamum indicum*. Tetravalents were formed by most of the chromosomes with some secondary association, which occurs also in the diploids.

572 Iljina, A. I.
(The causes of dehiscent pods in sesame).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. **6** : 58–61. [Russian].

At the USSR Scientific Research Institute of Oil Plants, the dehiscence of varieties 81 and 96 was studied in relation to the development of the parenchyma in different portions of the pod. It is suggested that selection of indehiscent material should involve evaluation of the parenchyma at the distal tip of the pod and the placental region.

573 Langham, D. G. and Rodriguez, M.
Variedades mejoradas de ajonjolí (*Sesamum indicum* L.). **[Improved varieties of sesame (*S. indicum* L.)].**
Hacienda, N.Y. 1947 : **42** : p. 56.

Descriptions are given of two varieties: Venezuela 51, which combines early maturity with high yielding capacity and resistance to *Myzus persicae*, *Alternaria* sp. and *Cercospora Sesami;* and Venezuela 52, a hybrid between Selection 5 and the variety Criollo, combining high yielding ability with resistance to *M. persicae* and to drought, though it is less resistant to fungous parasites.

574 Mazzani, B.
Una nueva variedad de ajonjolí (*Sesamum indicum* L.) producida en el Instituto Nacional de Agricultura. **[A new variety of sesame (*S. indicum* L.) produced in the National Institute of Agriculture].**
Agron. Trop., Venezuela 1952 : **1** : 269–77.

The variety Acarigua, derived from a cross between a Nicaraguan and a Chinese form, back-crossed to Venezuela 51, is described. It has exceeded local varieties materially in yield, particularly in the Acarigua and similar regions of Venezuela, where resistance to both excessive humidity and drought are required.

575 André, É., Carbouère, M. and Maille, M.
Sur la teneur en huile et en linamaroside des graines de diverses variétés de lin. **(On the content of oil and linamaroside in the seeds of various varieties of flax).**
CR Acad. Sci. Paris 1950 : **231** : 590–92.

Oil and linamaroside contents have been determined for a series of linseed and fibre flax varieties from the Versailles plant breeding station. The highest oil content was 44·7% in an introduction from Bulgaria. The lowest linamaroside contents were in the varieties Bolley Golden and Diehl. It was confirmed that fibre flax varieties have a higher linamaroside content than oil flaxes, but the suggestion that low toxicity is correlated with white flowers was rebutted by the presence of blue flowers in the variety Diehl.

576 Deshpande, R. B. and Jeswani, L. M.
Inheritance of resistance to rust [*Melampsora lini* (Pers.) Lev.] in linseed.
Indian J. Genet. 1951 : **11** : 196–204.

Further investigations are reported (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2079) on the rust reaction of F_1, F_2 and F_3 progenies from crosses between (*a*) B 5–14, an early maturing but rust susceptible strain, and two rust resistant New Pusa strains, 96 and 202; (*b*) rust susceptible *Linum usitatissimum* and resistant *L. angustifolium;* and (*c*) *L. usitatissimum* and a rust immune species, *L. africanum*. In all cases resistance proved completely dominant over susceptibility, being inherited monogenically without linkage to any morphological characters.

577 Elliott, C. S.
Trials of linseed varieties 1948-1950.
J. Nat. Inst. Agric. Bot. 1951 : **6** : 29–38.

Results obtained from trials organized by the National Institute of Agricultural Botany in different parts of England show that varieties are now available which outyield Royal and Redwing under local conditions. Valuta, a late maturing variety, and Dakota, an early ripening variety, are recommended in place of Royal and Redwing respectively.
The characters used in distinguishing varieties of linseed are discussed.

578 Bunting, E. S. and Blackman, G. E.
Varietal differences in linseed.
J. Nat. Inst. Agric. Bot. 1951 : **6** : 45–48.

Results of trials undertaken by the Agricultural Research Council Unit of Experimental Agronomy at Oxford from 1948 to 1950 are in agreement with the report summarized in Abst. 577.

579 **Flax variety trials on Dominion experimental farms and stations 1951.** Mim. rep. No. 125 : Pp. 32.

Seed yields of 25 varieties grown at 12 Canadian stations are reported. Redwood, Rocket, Victory and selections of Victory gave consistently high yields. Ottawa 3870A (JWS $153B_9$ x La Previsión 18) outyielded the other new hybrids and showed the highest iodine number of all varieties tested. Redwood had the highest oil content at all stations. Preliminary fibre trials were also undertaken.

580 Planck, R. W., Pack, F. C. and Skau, D. B.
Abstract bibliography of the chemistry and technology of tung products, 1875-1950. Southern Regional Research Laboratory, New Orleans 1952 : 1-4 : Pp. 811. (Mimeographed).

The first sections of this abstract bibliography cover the following: (1) general aspects; (2) tree production, including variation, breeding, propagation, diseases, anatomy, physiology, fertilizers, yields, and cultivation in various countries; (3) chemical composition and other aspects of fruit production; (4) oil studies; (5) eleostearic acid and its derivatives; (6) cake and meal; and (7) production, trade statistics and economics. The remaining sections deal with patent literature.

581 Noguchi, Y.
On the diploid gigas-type selected in the progeny of tetraploid sunflowers.
Ikushu-kenkyu (Researches of Plant Breeding) 1950 : **4** : 105–12.
[from Rec. Res. Fac. Agric. Univ. Tokyo 1950–1951 (1952) : No. **1** : 1–2 (Abst.)].

Tetraploid sunflowers were obtained by colchicine treatment. The progenies were selected during eight generations for large seeds and high oil content, and eight promising strains were obtained, all of which proved, on examination, to be diploid.

582 Ryžeeva, O. I.
(Vegetative hybridization between safflower and sunflower).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. **5** : 77–78. [Russian].

At the Kirgizian State Breeding Station, direct and reciprocal grafts were made between the safflower Krasnovodopadskiĭ 4 and the sunflower Saratovskiĭ 169 [Saratov 169]. One graft hybrid was obtained by cleft grafting a 10 day old safflower and another by grafting dormant buds of a 20 day old safflower upon a 30 day old sunflower plant. Two inflorescences were left on the former and these were pollinated with mixed pollen of sunflower + safflower. Some small but normally developed seed was obtained. This gave two vigorous spineless plants with more flowers than normal safflower. The other graft hybrid produced 13 shoots, all but 4 of which were removed. It was pollinated by a sunflower. Some large normally developed seed was obtained. This gave 23 vigorous plants with 34 flowers each. They had smaller spines than the normal safflower plants. The husk content of some of the F_1 graft hybrids was lower than that of safflower.

583 Jagoe, R. B.
The "dumpy" oil palm.
Malay. Agric. J. 1952 : **35** : 12–21.

Work on the dumpy type of Deli palm in Malaya is described. The history of the original dumpy form, E 206, and of its selfed progeny and progenies from crosses with normal tall selections is outlined. The large girth of the dumpy palm is accompanied by a slow rate of increase in height and high rate of fruit bunch production. The girth of hybrid progenies is intermediate between the dumpy progenies and selfed progenies of the tall parents; the large girth of the dumpy palms therefore appears to depend upon quantitative inheritance. The selfed progeny of E 206 has segregated fairly widely for fruit and yield characters, but has however shown remarkable uniformity for dumpiness. The F_1 of E 152 x E 206 has given a high percentage of good fruit per bunch. Palms from this progeny have therefore been crossed with selections from the selfed progeny of E 206, in an attempt to transfer this character to the dumpy type, which has a low percentage. F_2 legitimate dumpy seedlings have been distributed for trial on estates. The value of seedlings from the cross (E 206 x tall palm E 268) x selfed E 206 as a means of counteracting any undesirable effects of inbreeding, is being explored. Breeding has also been undertaken to combine the high percentage of pericarp of the *tenera* type and dumpy habit.

584 JAGOE, R. B.
"Deli" oil palms and early introductions of *Elaeis guineensis* to Malaya.
Malay. Agric. J. 1952 : **35** : 3–11.

Information is given on the history of the Deli type in the East Indies and on the introduction of oil palms into Malaya and subsequent experimental plantation and improvement by breeding and selection.

585 APURBA KUMAR GHOSE
Chromosome numbers and meiotic behaviour in two species of *Caesalpinia.*
Sci. & Cult. 1952 : **17** : 384–85.

Data on *C. Coriaria* (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 763) and *C. Sappan* are presented; in the latter species 12 bivalents have been reported for the first time at meiosis.

586 MUKHERJEE, S. K.
Cytology of *Adhatoda vasica* Nees.
Curr. Sci. 1952 : **21** : p. 77.

Meiosis in *A. vasica* ($n = 17$), an Indian plant with important medicinal properties, is normal. Some evidence of secondary association during metaphase was obtained. Among the seven other genera of the Acanthaceae, *Ruellia* contains five species with $2n = 34$. Whether this similarity indicates a closer affinity between these two genera is not yet certain; pollen and floral morphology do not however suggest such a relationship.

587 **Note on clone L.C.B. 1320.**
R.R.I. Plant. Bull. 1952 : No. **1** : 16–18.

Information is given on the performance of the promising Javanese *Hevea* clone LCB 1320. It has been recommended by the Proefstation van der Lands Caoutchouc Bedrijven for large scale use in Java and southern Sumatra. Data on its yield in Malaya are not yet available; experimental plantings of the clone are however advocated.

588 **Report of the work of the Rubber Research Board in 1951.**
Rubb. Res. Scheme, Ceylon 1952 : Pp. 82.

De Silva, C. A. Report of the botanist for the year 1951. (pp. 16–31).

Trials of clones and clonal seedlings are reported.

Young, H. E. Report of the Oidium *research officer and mycologist for the year 1951. (pp. 32–38).*

Clone LCB 870 again showed field resistance to *Oidium* mildew. Further crosses between LCB 870 and high yielding clones were carried out.

589 **A note on *Hevea spruceana.***
R.R.I. Plant. Bull. 1952 : No. **1** : 12–15.

H. Spruceana is not recommended for planting in Malaya, since both the pure species and its hybrids with *H. brasiliensis* produce a very small amount of rubber, and the quality of rubber from the pure species is of no commercial value. The vigorous interspecific hybrids have so far shown no advantages as rootstocks for budding *H. brasiliensis* clones.

590 CRAMER, P. J. S.
Historique de la méthode testatex. (**The story of the Testatex method**).
Bull. Agric. Congo Belge 1952 : **43** : 455–62.

This concluding report, published posthumously, completes the earlier paper (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 1366) on the effectiveness of early trial tappings with the Testatex knife as a way of eliminating inferior plants in rubber plots. The results here analysed relate to experiments made in 1934 in Indochina and agree with Pichel's findings (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2938).

591 YOUNG, H. E.
Leaf mildew of rubber—a review.
Quart. Circ. Rubb. Res. Inst. Ceylon 1952 : **27** : 3–15.

In Ceylon a start has been made on breeding for *Oidium* resistance by studying seedlings from crosses between high yielding clones and the resistant clone LCB 870.

592 Lasschuit, J. A. and Vollema, J. S.
De meeldauwresistente cloon LCB 870.
(The mildew resistant clone LCB 870).
Bergcultures 1952 : **21** : 257–61.

An attempt was made to combine the mildew resistance of this low yielding *Hevea* clone with a satisfactory production of latex by crown budding it on other seedling material. The results showed, however, that the LCB 870 crowns reduced the yield of the seedling stocks by 25%, as compared with the unbudded controls at the same height. The depressive effect apparently extended to 1–1·5 m. below the site of union.

593 Lašuk, G. I.
(New data on the biology of *Cistus*).
Agrobiologija (Agrobiology) 1952 : No. 4 : 98–105. [Russian].

C. villosus 6360, *C. albidus* 157 and other promising lines selected from introduced material at the Nikita Botanical Garden are referred to. In preliminary trials the selected forms proved superior to *C. tauricus* in the yield and quality of the resins.

FRUITS AND NUTS

594 **Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1950 to 30th September, 1951** (1952) : Pp. 208.

Rogers, W. S. I. Pomology. (pp. 25–31).

Studies of varietal resistance to cold damage in apples and other fruits, under field conditions and in cold chamber tests, continued.

In work on the development of apple scion varieties resistant to woolly aphid, a number of seedlings have exhibited a high degree of resistance to artificial infestation in two seasons. Attention is being given to late flowering in apple breeding. The effects of different pollen parents on the size, weight and other characters of the fruit of Cox's Orange Pippin are being investigated.

Several black currant seedlings ripening very late have been selected from a cross between Amos Black and Baldwin. Further hybrids between the black currant and other species of *Ribes* have been produced. Colchicine-induced aberrant forms of black currant, possibly tetraploids, are under observation. Raspberry breeding continued.

Hoblyn, T. N. and Pearce, S. C. II. Statistics and records. (pp. 32–33).

Designs in which use can be made of outside trees in experimental plantations have been further studied. Methods have been devised for laying out calibration trials with three varieties of a tree fruit. A comparison of pairs of treatments in split-plot experiments has been completed (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 1461). Work being carried out on plant variation and sampling includes a study of the relative accuracy of main plot and subplot comparisons in split-plot designs.

Harris, R. V. V. Plant pathology. (pp. 40–42).

Some new seedlings of hop exhibited a high degree of resistance to *Verticillium* wilt and are to be propagated for further trial. In large scale commercial plantings, OR 55 (Keyworth's Midseason) has continued to show, with increasing age, a progressive diminution in the proportion of hills developing wilt symptoms.

Harris, R. V. and Cadman, C. H. A.R.C. Scottish raspberry investigation. (p. 51).

Evidence has been obtained that the decline of Lloyd George is caused by a combination of severe mosaic 2 and a second virus, provisionally named bushy dwarf. Work on stock testing, the nuclear stock propagation scheme and field variety trials is reported.

Tydeman, H. M. The influence of the pollen parent on the development of apple fruits. (pp. 62–66).

Significant differences in diameter and weight were found between Cox's Orange Pippin apples resulting from pollination with King of the Pippins and Worcester Pearmain. Application of α-naphthalene-acetic acid considerably reduced these differences. Pollen source had no effect upon quality and time of maturity.

Wood, C. A. Raspberry varieties in Great Britain. (pp. 82–92).

Detailed descriptions of 11 commercially important varieties are presented. Descriptive notes of varieties having only minor commercial significance and hybrid raspberries recently introduced for trial are also provided.

Tydeman, H. M. Michaelmas Red—a new dessert apple. (p. 100).

Michaelmas Red, bred from a cross between Worcester Pearmain and McIntosh Red, is being distributed for trial by growers, as a dessert variety maturing during late September and early October, after Worcester Pearmain.

Pearce, S. C. The design of calibration trials with three varieties. (pp. 105–07).

Two tile designs are described for calibration trials of three fruit tree varieties.

Beard, F. H. Seven clonal selections of Golding hops. (pp. 189–96).

The results of a trial of seven clonal varieties of Golding hops are described. Early Bird, Petham Golding and Eastwell Golding are recommended as early, midseason and late varieties, respectively.

595 DUKA, S.
(New varieties of fruit trees for the Ukrainian SSR).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 8 : 55–56. [Russian].

Breeding pome, stone and soft fruits at the Ukrainian Scientific Research Institute of Horticulture and its branches is reported. Some of the new varieties listed below have been previously referred to in *Plant Breeding Abstracts*, Vol. XXII, Abst. 1390 and Vol. XXIII, Abst. 626). The breeding methods included wide crosses and Mičurinite training.

Apple. Šahterskoe [Miner], Slava Donbassa [Donbass Glory] and Pamjatj Artema [Artem's Memorial] are hardier and produce better quality fruits than previously cultivated varieties. Pervomaiskoe [First of May] is a good annual bearer and its fruits will keep till May, besides possessing the good properties of the varieties referred to above.

Apricot. Baĭrak and Soročinskiĭ [Soročinsk] reach maturity in July and Kievskiĭ 2006 [Kiev 2006] in August. They are hardy and produce attractive fruits of good flavour. Kievskiĭ 2006 has the largest fruits.

Cherry. Kievskaja 11 [Kiev 11] is hardy and early under the conditions of northern Ukraine. It reaches maturity on 7–12 June and produces dark red small-stoned fruits of good flavour. Kievskaja 2 and Kievskaja 5 have similar properties and reach maturity on 10–15 June and 15–20 June respectively. The former bears larger fruits than Kievskaja 11.

Peach. Kievskiĭ Samyĭ Rannyi [Kiev Earliest], Kievskiĭ Ranniĭ [Kiev Early] and Kievskiĭ Pozdniĭ [Kiev Late] are tolerant of −30° C.

Strawberry. Kievskaja Rannjaja 2 [Kiev Early 2] has a growth period of 22–25 days and reaches maturity in mid-May. It is hardy and shows resistance to drought. The fruits weigh 14–15 grm. and their flavour is good.

596 FEDORENKO, M. M.
(The breeding of new varieties by Mičurinites at the Krošenskiĭ Technical College).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 21–24. [Russian].

Several new productive hardy varieties of apple, apricot and peach were obtained by Mičurinite methods, including the use of mentors, in the Polesje.

Apple. New hybrids included promising early, mid-season and late varieties.

Apricot. Several hardy seedlings with good quality fruits have been raised from material consisting of Kaščenko varieties and local apricots from the Žitomir, Kiev and Rostov provinces, the Don Basin and Moldavia. The variety Krasnoščekiĭ [Red Cheek] was used as a mentor for all selected material. Some new apricots reach maturity in July, others in August.

Peach. Seedlings 9 and 17, remarkable for the good size and flavour of their fruits, have been selected.

597 VEKSLER, A. I.
(Mičurinites at the Nikita Botanical Garden).
Priroda (Nature) 1952 : No. 4 : 86–88. [Russian].

Apricot. Productive varieties with varying dates of maturity have been developed in recent years at the institute; of these Komsomolec [Komsomol], Jubileĭnyĭ [Jubilee], Konservnyĭ Pozdniĭ [Late Processing], Podarok [Offering] and Nahodka [Find] are remarkable for their large, sweet and juicy fruits.

Plum. New early varieties showing resistance to diseases and pests, including Pobeda [Victory], Zolotisto-Oranževaja [Golden Orange] and Partizanka [Partisan], have been bred from *Prunus triflora* x *P. Cerasus*.

Cherry. Russkaja [Russian], Pobeda [Victory], Lastočka [Swallow] and Južnaja [Southern] are referred to as the best new early dessert and processing varieties. Pionerka [Pioneer], an early seedling from local *P. Cerasus* material, has large dark purple fruits of good flavour.

Peach. Kremlevskiĭ [Kremlin], Valeriĭ Čkalov, Nikitskiĭ [Nikita] and several other productive varieties with large attractive fruits of good quality have been bred by Mičurinite methods.

Fig. Over 350 varieties have been tested for hardiness, earliness and quality of the fresh or preserved fruit. The best varieties include Kadota, Finikovyĭ [Date], Fioletovyĭ [Mauve], Dalmatskiĭ [Dalmatian] and Calimyrna (= Lob

Injir [Luscious Fig]) and the best new hybrids Smena [Change], Podarok Octjabrja [October Offering], Livadiĭskiĭ [Livadia], Nikitskiĭ Aromatnyĭ [Aromatic Nikita] and Solnečnyĭ [Sunny]. The hybrids are notable for their early maturity and large sweet fleshy fruits with a high content of vitamins A and C.

Almond. Bumažno-skorlupnyĭ [Paper Shell], Sovetskiĭ [Soviet] and Nikitskiĭ Pozdnocvetuščiĭ [Nikita Late-flowering] are the most promising of the new varieties and show a high degree of resistance to fungous diseases.

Olive. Nikitskaja 23 [Nikita 23] and Krymskaja 172 [Crimean 172] have been selected from local material. They are productive and tolerant of drought, cold and pests. Other promising varieties, Nikitskaja [Nikita], Nikitskaja Krupnoplodnaja [Large-fruited Nikita], Krymskaja [Crimean] and Kolhoznica [Collective Farmer] have been obtained by multiple hybridization. Nikitskaja and Kolhoznica are regarded as superior to all known varieties in respect of high oil content, productiveness and hardiness. They reach maturity early and have fruits with tender flesh.

598 Tuinbouwdagen 1951. Tekst van de voordrachten gehouden op de tuinbouwdagen 1951, Wageningen 28–30 Maart. (**Horticultural Days 1951. Text of the lectures held at Wageningen 28-30 March).**

Meded. Dir. Tuinb. 1951 : **14** : 471–726.

Papers read at the above meetings included the following:—

Beijerinck, W. Hazelnotenteelt. (Hazel culture). (pp. 513–22).

This paper has been summarized in Abst. 638.

Gerritsen, C. J. Walnotenteelt. Economische aspecten en stand van het rassenonderzoek. (Walnut growing. Economic aspects and the position regarding research on varieties). (pp. 523–39).

Lines along which improvement of walnuts for cultivation in Holland may be pursued are suggested, and the value of foreign and Dutch varieties for selection and subsequent breeding is considered. A scheme for selection, inspection and ultimate certification of approved trees was started in Holland a few years ago.

Banga, O. Bescherming van de kwekerseigendom. (Protection of plant breeders' rights). (pp. 636–46).

Questions concerning the identification and naming of plant varieties that are vegetatively reproduced, self pollinated or cross pollinated are discussed. Legal aspects are also considered.

Kers, D. De witlofteelt. (The culture of witloof chicory). (pp. 647–56).

Witloof chicory selection has been in progress for some years in Holland. Lines have been selected for yield, quality and suitability for early or late forcing. The Dutch strains are best for late forcing and the Belgian for early forcing.

Astrego, J. J. Rassen-, selectie- en hiermede samenhangende problemen bij de aspergeteelt. (Problems connected with research on varieties and strains in asparagus culture). (pp. 657–71).

Asparagus selection and hybridization has been carried out in Holland to obtain improved strains from commercial varieties. Both the European variety Ruhm von Braunschweig [Glory of Braunschweig] and the American variety Mary Washington have proved to be less homogeneous than supposed, and the latter is now undergoing further selection. Recognizing the superior productivity of male plants, Dutch investigators have used hermaphrodite plants to obtain purely male progenies (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1203 and Vol. XXII, Abst. 1495).

Sneep, J. Selectie op het juiste tijdstip. (Selection at the right time). (pp. 672–78).

The right time for judging and selecting horticultural plants is when the crop is ready for harvesting and sale. The choice of plants for seed production is thus a difficult matter with crops such as autumn endive and cauliflower, harvested from October to December, and summer cauliflower too, since seed is not formed at the proper time for judging and selection. By suitable methods, however, selected mother plants of the above two autumn vegetables can be successfully overwintered in pots and stock seed obtained in due time. Selected summer cauliflowers can also be induced to seed in spring earlier than usual by propagation by cuttings in September and bringing them through the winter under glass.

Visser, T. Bloembiologie en kruisingstechniek bij appel en peer. (Floral biology and hybridization technique in apples and pears). (pp. 707–26).

The results are cited of experiments during 1948–50 on methods for studying sterility, incompatibility, parthenocarpy, etc. in apples and pears.

599 Bailey, C. and Hegwood, M.
Recent activities in fruit breeding.
Hort. News, N.J. 1952 : **33** : 2550, 2552.

At Rutgers University, New Brunswick, the early maturing red apple NJ 15 was crossed with a large-fruited selection of good dessert quality. Crosses were also effected to improve scab resistance of commercial varieties, using pollen from a large-fruited scab resistant seedling; two naturally occurring tetraploids of Jonathan and McIntosh were among the trees used as females.

The F_2 of crosses between commercially grown pears and selections with inferior fruit quality but some resistance to fireblight are being inoculated with strains of *Bacillus amylovorus* from different parts of the country; thus it is hoped that seedlings selected for their high degree of resistance to fireblight will maintain this characteristic in all districts.

Numerous peach crosses were made to combine attractive fruit quality with early or late maturity; soon after germination of segregating progenies, undesirable white-fleshed types were separated from the yellow-fleshed individuals on the basis of cotyledon colour.

600 Granhall, I.
Berättelse över verksamheten vid Balsgård år 1949. (**Report on the work at Balsgård 1949**).
Fören. Växtföräd. Frukttträd 1949 (1950) : Pp. 23.
Granhall, I.
Berättelse över verksamheten vid Balsgård år 1950. (**Report on the work at Balsgård 1950**).
Fören. Växtföräd. Frukttträd 1950 (1951) : Pp. 15.

In continuance of the programme of selection and breeding which is being carried out on pome and stone fruits and on nuts by the Förening för Växtförädling av Frukttträd [Association for the Breeding of Fruit Trees], Balsgård, extensive crossings have been made (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts 635, 2193 and 2206). The work has included: interspecific hybridization of *Prunus;* the production of new polyploids by colchicine treatment and of mutants by X irradiation; selection of apple and quince stocks; and crossings of hazels.

In 1950, the Balsgård Institute collaborated in Gustafsson's work on the artificial induction of mutants in apples, pears, plums and cherries by various agencies including neutrons, mustard gas and radioactive isotope injections of phosphorus and sulphur.

601 Baharev, A. N.
(The most recent research of the Mičurinites).
Priroda (Nature) 1952 : No. **7** : 73–83. [Russian].

An account of Mičurinite methods in breeding horticultural plants and cytological research at the Mičurin Central Genetical Laboratory (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2187) is given. Mention is made of an early hardy water melon, Mičurinskiĭ 01 [Mičurinite 01], bred from Melitopoljskiĭ 142 [Melitopolj 142] x Stokes.

602 Darrow, G. M.
Polyploidy in fruit breeding.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 283–84.

Many instances of successful hybridization between fruits at different polyploid levels, combining genomes of existing fruits and overcoming sterility by artificially doubling chromosome complements are cited in a general survey of the use of polyploidy in fruit breeding. Particular reference is made to new polyploid combinations arising from blackberry hybridization in Oregon.

603 Brown, D. S.
Climate in relation to deciduous fruit production in California. IV. Effect of the mild winter of 1950-51 on deciduous fruits in northern California.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 111–18.

Data are presented on the differential responses of locally grown varieties of tree fruits, walnut and almond, with respect to flower bud deterioration and shedding. Franquette walnut showed prolonged dormancy.

604 Barrett, H. C. and Arisumi, T.
Methods of pollen collection, emasculation and pollination in fruit breeding.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 259–62.

Three techniques facilitating hybridization have been devised at the University of Illinois. Instead of using forceps to detach anthers, pollen may be more rapidly collected before anther dehiscence by rubbing the flowers against a sieve through which only the anthers will pass. A more efficient emasculator than forceps is described; it consists of scissors with a notch in each blade to encircle the floral parts and an adjustment to regulate the depth of cutting according to the variety. A simply constructed pollen atomizer has successfully taken the place of a brush for effecting pollination; it can be used efficiently on windy days.

605 EHRENBERG, L. and GRANHALL, I.
Effects of *beta*-radiating isotopes in fruit trees.
Hereditas, Lund 1952 : **38** : 385–424.

Methods are described by which it is possible to introduce β-radiating P^{32} and S^{34} into sensitive meristematic tissues of apple, pear and cherry in doses of a magnitude sufficient to produce perceptible mutations. Although β-rays from P^{32} have in some cases produced lethal effects, they have as yet caused fewer shoot bifurcations and leaf deformities than X rays. This difference in mutagenic capacity is associated with the prolonged irradiation period necessitated by the method of treatment and with the low specific ionization of P^{32} β rays. However, since the isotopes exert their influence only on meristematic tissues, and since, in experiments with barley, they have induced mutations which are qualitatively distinct from those resulting from X irradiation, it appears that they will prove valuable mutagenic agents for fruit tree breeding.

606 POPOV, V.
(New varieties of fruit trees and berries).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 6 : 59–60. [Russian].

The following varieties have been recently developed at the Scientific Fruit Research Institute, Mičurinsk.

Apple. Severnyĭ Sinap [Northern Sinap], Pamjatj Mičurina [Mičurin's Memorial], Zimnee Prevoshodnoe [Excellent Winter], Ivanovka, and Zolotoĭ Šar [Golden Globe] are regarded as the most promising of 26 new productive and hardy varieties with good keeping properties.

Apricot. Uspeh [Success], Laureate and Triumf Severnyĭ [Northern Triumph] are hardy under Tambov conditions.

Plums. The hardy and early bearing Zarja [Dawn], Rekord [Record], Severjanka [Northerner] and Narodnaja [People's] head the list of nine new productive varieties.

Gooseberry. Of the seven varieties under trial, Russkiĭ [Russian], Plodorodnyĭ [Prolific], Severnyĭ Vinograd [Northern Grape], Pioner [Pioneer] and Malahit [Malachite] are remarkable for their large fruits and resistance to mildew.

Strawberry. Rubinovaja [Ruby], Udarnica [Shock-Worker], Maršaljskaja [Marshal] and Russkaja [Russian] are hardier and more productive than the standards Roščinskaja and Koralka [Coral].

607 MEURMAN, O.
Melba, Kanadalainen omenapuulajike. **(The Canadian apple variety Melba).**
Valt. Maatalousk. Tiedon. 1940 : No. 177 : Pp. 12.

An outline is given of the history of the above variety, which was introduced into Finland in 1926. Its characteristics, response to environmental factors and economic value are surveyed.

608 **Crandall apple.**
Amer. Nurserym. 1952 : **96** : No. 2 : p. 62.

Crandall, an apple suitable for both dessert and cooking obtained from Rome Beauty x Jonathan, has been released by the Illinois Agricultural Experiment Station. The trees are of the low spreading Rome type; the fruits are of good commercial size, yellow and red in colour, aromatic and of a mild subacid flavour.

609 MILEŠKO, A. F.
(The Crimean Sinaps in apple breeding).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : p. 73. [Russian].

Promising material has been obtained at the Crimean Zonal Fruit Research Station from crosses involving the Crimean apples Sary Sinap [Yellow Sinap], Sudakskiĭ Sinap [Sudak Sinap] and Candille Sinap. Hardy hybrids with fruits of good quality include hybrids between Sary Sinap and the following varieties: Beljfler Želtyĭ [Yellow Bellefleur], Orleans Reinette, Winter Golden Pearmain and Belyĭ Zimniĭ Kaljvilj [White Winter Calville]. Crosses involving European varieties as female parents, for instance Champagne Reinette x Candille Sinap, proved less hardy.

It was found that the quality of the fruit could be evaluated by the similarity of its appearance to that of its European parent.

610 EINSET, J.
Spontaneous polyploidy in cultivated apples.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 291–302.

This general review deals with the occurrence of polyploid seedlings as a result of fusion of unreduced gametes, spontaneous doubling of chromosome complement in root tissues and the occurrence of diploid-tetraploid periclinal chimeras bearing large fruits. The general stability of the distributional pattern of diploid and tetraploid cells in chimeras is discussed with reference to the production of haploid or diploid gametes. Selections which have consistently produced diploid gametes at the New York State Agricultural Experiment Station are being incorporated in a programme of hybridization involving tetraploids.

611 Oberle, G. D. and Goertzen, K. L.
A method for evaluating pollen production of fruit varieties.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 263–65.

The relative efficiency of tree fruit varieties as pollinators has been determined at the Virginia Agricultural Experiment Station, using a hemacytometer to count the normal pollen grains released by samples of 100 fully developed anthers. Among the apples tested, Delicious produced 85% mature grains, whereas anthers of Stayman and Winesap contained only 20% normal microspores.

612 Howlett, F. S. and Ellenwood, C. W.
New Ruby apple is produced by crossing Gallia Beauty and Starking.
Fm. Home Res. 1952 : **37** : 51, 66.

The development of an annual-bearing variety named Ruby (Gallia Beauty x Starking) at the Ohio Agricultural Experiment Station is reported. Ruby has attractive red fruits of good flavour and firm texture, suitable for dessert and cooking purposes and storing well until late April or May. The new variety is less susceptible to scald than Rome Beauty.

613 Clarke, W. S.
A comparison of the storage life of standard varieties of apples with their red bud sports.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 315–18.

Although Delicious and its red-fruited sport, Starking, store equally well at 30–32° F, the red-fruited sports of Northern Spy, Jonathan, Rome Beauty and Stayman Winesap deteriorated sooner than the parent varieties. The early deterioration of Red Spy was very marked, but differences were not apparent between the three others sports and their parents until much later in the storage season.

614 Isaev, S. I.
(**New winter and autumn varieties of apple**).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. **6** : 12–17. [Russian].

Some promising late apple varieties developed in recent years by Mičurinite methods at Mičurinsk have been submitted for trials in several provinces of Russia. Descriptions are given of Oktjabrenok [Little Octobrist] from Antonovka Obyknovennaja [Common Antonovka] x Pepin Šafrannyĭ [Saffron Pippin], Partizanka [Partisan] from Pepin Šafrannyĭ x Beljfler Kitaĭka [Bellefleur Chinese Crab], Korejanka [Korean] from Koričnoe Polosatoe [Brown Striped] x Wealthy, Osennee Polosatoe [Autumn Striped] from Koričnoe Polosatoe [Brown Striped] x Wealthy, Pobeditelj [Victor] from Antonovka Obyknovennaja x Jonathan, Ivanovka from Antonovka Obyknovennaja x Šafran-Kitaĭka [Saffron Chinese Crab] and the seedlings Severnyĭ Sinap [Northern Sinap] and Pamjatj Mičurina [Mičurin's Memorial], the former derived from Candille Chinese Crab and the latter from Šampanren-Kitaĭka [Champagne Reinette Chinese Crab]. All the above varieties proved hardy under Mičurinsk conditions and produced fruits of good quality; some carried resistance to scab, earliness and annual bearing.

615 Barak, D.
(**Some observations on stocks and varieties of deciduous fruit trees**).
Hassadeh 1952 : **32** : 188–90. [Hebrew].

Fruit tree surveys in the Mishmar Ha'emek district of Israel showed varying rootstock reactions among apples to a high Ca content in the soil. East Malling stocks 2, 12, 14 and 15 withstood a high Ca content best. Scions also seemed to influence the rootstock in adaptation to high Ca content, and the apple varieties Jonathan, Delicious and Rome Beauty were notably more successful on any rootstock on calcareous soils than other varieties.

A single trial on resistance to attacks by field mice showed that the seedling stock Zaria and East Malling stocks 15 and 16 were least susceptible.

In tests of seedlings, those from Rome Beauty and Queen of the Reinettes resembled the parent trees.

616 Maugini, E.
Ricerche citogenetiche sulle antere di due ibridi di *Pyrus* e dei loro genitori. (**Cytogenetic researches on the anthers of two *Pyrus* hybrids and their parents**).
Caryologia 1952 : **4** : 295–310.

The development of the anthers and of the pollen mother cells is described in two diploid pears, Winter Doyenné and Kieffer Seedling, where it proved to be normal, and in two hybrids between them. In hybrid 17 no disturbances were noted until after the first meiotic division, when degeneration gradually set in in the tapetum and the archesporial cells, leading to complete male sterility. In hybrid 22 the degeneration set in before meiosis had begun. The cause of the disturbances is thought to be in the disharmony of the hormone system in the tapetal cells resulting from the combination of incompatible genes from the respective parents.

617 Tavernier, J. and Jacquin, P.
Sur la présence de l'acide citrique dans la poire. Teneur comparative des moûts de poires en acides citrique et malique. **(On the presence of citric acid in the pear. Comparative values of citric and malic acids in the juice from pear varieties).**
CR Acad. Sci. Paris 1948 : **226** : 1393–94.

The juice of a series of French dessert and perry pears was analysed for malic and citric acid contents. Marked varietal differences were noted. In all the dessert and some of the perry pears, the citric acid content was comparatively low, but in some of the perry varieties it reached as high a figure as 68% of the total acidity.

618 Dunegan, J. C., Goldsworthy, M. C., Moon, H. H. and Wilson, R. A.
A rapid method for testing susceptibility of pear seedlings to *Erwinia amylovora.*
Phytopathology, 1952 : **42** : p. 341. (Abst.).

Seedlings from parents known to be susceptible to *E. amylovora* developed blight symptoms after being sprayed with an aqueous suspension of the pathogen mixed with an abrasive; the slow process of inoculating seedlings by hand may therefore be avoided in future trials.

619 **New red plum.**
Amer. Nurserym. 1952 : **95** : No. 6 : p. 93.

Trees propagated at the Idaho Agricultural Experiment Station from a mutant red-fruited branch of the greengage have been named Reine Red. The plums have an attractive red colour and retain the flavour of the green variety.

620 Peynaud, É.
Sur les acides organiques des pêches et des prunes. **(On the organic acids of peaches and plums).**
CR Acad. Sci. Paris 1951 : **232** : 2474–75.

Data are given of the sugar content, total acidity, and contents of malic, citric, pectic and phosphoric acids in a series of French varieties of peaches and plums. The proportion of the total acidity due to unidentified acids ranged from 20 to 60%. High total acidity was correlated with a high malic acid content.

621 Haritonova, E. N.
(The effect of the age of the female parent upon the quality of the hybrids).
Agrobiologija (Agrobiology) 1952 : No. 4 : 147–50. [Russian].

At the Genetical Laboratory, Mičurinsk, several cherry hybrids produced more fruits and more viable stones when the female parent involved in the cross was 5–6 years old than when it was over 12 years old. Three promising hybrids from Ostheim Griotte x Kent were selected.

622 Kolesnikov, M. A.
(Mičurin varieties of cherry in the Krasnodar territory).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 7 : 40–41. [Russian].

The late cherries Monomah and Bastard Čerešni [Sweet Cherry Hybrid], the mid-season varieties Servirovočnaja [Service], Serednjačka [Medium Tall] and Polžir and the early cherry Sejanec 5 [Seedling 5] were promising. Most varieties were tolerant of pests and diseases, though the late varieties showed susceptibility to grey rot and Servirovočnaja also to shot hole.

623 **New early peach.**
Amer. Nurserym. 1952 : **96** : No. 4 : p. 44.

The variety Cardinal, a seedling of Halehaven selfed, has been released by the US Bureau of Plant Industry for propagation. It ripens four days earlier than Dixired and up to six weeks earlier than Elberta. The fruits closely resemble those of Dixired in size, colour, appearance and firmness.

624 Gentile, G.
La nuova pesca precoce "Mimí del Forno." **(The new early peach Mimí del Forno).**
Riv. Ortoflorofruttic. Ital. 1952 : **36** : 135–36.

The peach here described was discovered in an orchard near Naples. It proved to be a new early variety from a natural cross. It merits attention on account of its colour, flavour, aroma, size and time of ripening, which occurred in 1951 between 24 June and 3 July, but, with favourable weather in normal years, may be 10–14 days earlier.

625 Overcash, J. P., Campbell, J. A., Hurt, B. C. and Crockett, S. P.
Effects of cold compared on 25 peach varieties.
Miss. Fm Res. 1950 : **13** : No. 12 : p. 1.
Different reaction to the mild winters experienced in southern Mississippi is discussed, with reference to prolonged dormancy. Varieties well adapted to the area are listed.

626 Rodionov, A. P.
(**Kiev peaches**).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 18–21. [Russian].
Descriptions are given of some hardy peaches, with attractive fruits of good quality, developed at the Ukrainian Institute of Horticulture. They have recently been made standards in the Ukraine.
Kievskiĭ Ranniĭ [Kiev Early] from Kievskiĭ 208 x Boljšoĭ Minjon [Large Mignon] reached maturity in mid-July. Kievskiĭ Samyĭ Ranniĭ [Kiev Earliest] is a seedling derived from local material. It is earlier than Kievskiĭ Ranniĭ and shows a higher degree of resistance to leaf curl. Kievskiĭ 01 was obtained from root suckers of an unknown variety originating from Mleev. It reaches maturity in August and shows resistance to leaf curl. Kievskiĭ Pozdniĭ [Kiev Late] was selected from seedlings of a peach grafted on a local apricot. The fruits ripen in September. Other seedlings derived from the same material had fruits with smooth skins, some as smooth as nectarines.

627 Klimenko, K. T. and Klimenko, V. N.
(**Pollination of citrus fruits with mixed pollen**).
Agrobiologija (Agrobiology) 1952 : No. 3 : 39–43. [Russian].
At the Nikita State Botanical Garden, pollination of some oranges, mandarins and grapefruits with the mixed pollen of several orange varieties proved beneficial to fruit setting and seed development. Even Navel oranges produced fruits containing seed when pollinated with the pollen of Gruzinskiĭ [Georgian] + Old Vini + Hamlin.

628 Zdruĭkovskaja, A. I.
(**The question of vegetative hybridization of the lemon**).
Bot. Ž. (Bot. J.) Moskva 1952 : **37** : 212–14. [Russian].
A method of vegetative rapprochement, consisting of growing immature embryos of the lemons Villa Franca, Meyer and Novogruzinskiĭ [New Georgian] in nutrient media containing the integuments and embryos of *Poncirus trifoliata* was developed at the Nikita State Botanical Garden. When the embryos developed or were about to develop their first leaves, they were grafted on *P. trifoliata* or *Citrus Junos*.

629 Prohorov, N. K.
(**Improving the hardiness of mandarins**).
Agrobiologija (Agrobiology) 1952 : No. 3 : 44–49. [Russian].
Mention is made of the hardy citrus hybrids 78 and 100, bred at Soči, which are recommended as rootstocks for citrus fruits.

630 Fleschner, C. A.
Host-plant resistance as a factor influencing population density of citrus red mites on orchard trees.
J. Econ. Ent. 1952 : **45** : 687–95.
Among the factors influencing resistance of citrus trees to red mite (*Paratetranychus citri*), intraspecific variation in heritable resistance is regarded as important.

631 Steyaert, R. L.
La "tristeza" des agrumes. (**Tristeza of citrus fruits**).
Bull. Agric. Congo Belge 1952 : **43** : 399–446.
Some information is given on the reaction of varieties, species and hybrids to tristeza and on premunition by an attenuated form of the virus.

632 Laudanski, F.
Étude préliminaire de quelques porte-greffes et sélections du mûrier. (**Preliminary study of some stocks and selections of mulberry**).
Progr. Agric. Vitic. 1952 : **69** : 341–47.
Cuttings of mulberry varieties suitable for silkworm culture tend to take badly and propagation is therefore usually effected by grafting on wildings, which are genotypically heterogeneous. The breeding of varieties that are suitable for the silkworm and also take well as cuttings is recommended. In the meantime five varieties suitable for silkworm raising were grafted on trees that give successful cuttings, though of little sericultural value, and the percentage of successful grafts and the vigour of the stocks in the nursery were determined.
The results showed the superiority of the stock Tonkin in both respects. Another promising stock Multicaule Bulle will undergo further tests. Two other selected varieties, 11A and 14A, which seem to be of interest, will also be

studied to find out whether they can be used as sericultural varieties, or as new stocks.

633 Grebenskaja, M. I.
(The structure of the mulberry seed).
Bot. Ž. (Bot. J.), Moskva 1952 : **37** : 214–19. [Russian].

The results of viability tests at Taškent on the seed of several varieties of mulberry, including a hybrid from *Morus Kagayamae* x *M. multicaulis*, are discussed.

634 Rajagopalan, N. S.
Annual Report of the Fruit Research Station, Kodur, for the year 1948-49 :
Pp. 16.

Varietal trials of citrus and mango are reported (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 993), with details of F_1 mango hybrids which have given fair yields of good quality fruit. Although more than 3000 controlled cross pollinations were effected between desirable strains, only four combinations proved compatible; seed of the four hybrids has been obtained for sowing.

635 Kumar, L. S. S. and Ranade, S. G.
Autotriploidy in guava (*Psidium guajava*, Linn.).
Curr. Sci. 1952 : **21** : 75–76.

The meiotic behaviour of a seedless variety studied at the College of Agriculture, Poona, indicates that the variety is triploid ($2n = 33$).

636 Schad, C., Solignat, G., Grente, J. and Venot, P.
Le problème du châtaignier en France. **(The problem of the chestnut in France).**
Bull. Tech. Ing. Serv. Agric. 1952 : No. 70 : 385–97.

Chestnut trees are required in France that are not only resistant to ink disease (*Phytophthora* spp.), *Endothia*, drought and winter and spring frosts, but are also ecologically well adapted, capable of thriving on inferior soil and late in coming into leaf. For reafforestation, rapid growth and high tannin content are also desirable.

Botanical studies have been made of *Castanea sativa*, *C. crenata* and *C. mollissima* and of their floral biology with special reference to intercompatibility and intersterility relationships between species or types of a particular species. Results of crossing, selfing and back crossing for ink disease resistance suggest that *C. sativa* carries resistance genes and also that susceptibility is multifactorially conditioned and that both dominant and recessive resistance factors coexist. Breeding material for future research comprises the two *C. crenata* types M 15 and M 49, derived from a cross between *C. crenata* and *C. sativa*, and the *C. sativa* types A, B and C obtained from seedlings of that species in the Ardèche region.

637 Schad, C. and Solignat, G.
Biologie florale et méthodes d'amélioration du châtaignier. **(Floral biology and methods of improving the chestnut).**
CR Acad. Agric. Fr. 1952 : No. 9 : 350–52.

Male and female sterility, self incompatibility and intercompatibility have been studied as a basis for breeding for resistance to ink disease by interspecific hybridization and back crossing. A method of inducing early flowering is described and the polycross technique is recommended when the ultimate choice of disease resistant trees comes to be made (cf. Abst. 636).

638 Beijerinck, W.
De hazelnotenteelt. **(Hazel cultivation).**
Meded. TuinVoorlDienst 1950 : No. 47 : Pp. 71.

This pamphlet provides information on the systematic classification, flowering, fruiting, germination and growth of the hazel; the cultivated varieties of Europe and the USA, with descriptions of 19 varieties and their origin; propagation and suitable stocks for budding; cultivation and harvesting; and the nutritive value and use of the nuts.

639 McCarty, C. D., Lesley, J. W. and Frost, H. B.
Bitterness (benzaldehyde content) of kernels of almond-peach F_1 hybrids and their parents.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 254–58.

Analyses of kernels obtained from Ontario, Calif., show that the majority of F_1 interspecific hybrids have a lower benzaldehyde content than their peach parents, but higher than the average content of the almond varieties. Three nonbitter hybrids were obtained from Jordanola almond x Peppermint peach. It is thought that several genes influence the bitterness of the interspecific hybrids, although most sweet almonds are heterozygous for a single dominant gene determining sweetness. In spite of the relatively high benzaldehyde content of the peaches, a wide range of variability was apparent, suggesting that a comparatively sweet type could be developed by selection.

640 Di Prima, S.
Contributo bio-statistico alla conoscenza delle varietà pugliesi di mandorlo. (**Bio-statistical contribution to the knowledge of the almond varieties of Apulia**).
Ann. Sper. Agr. 1952 : **6** : 721–39.

In continuation of earlier work (cf. *Plant Breeding Abstracts*, Vol. XX, Abst. 1900), data on fruit and seed characters are presented for 265 almond varieties from the Apulia region of Italy, indications being given of a number of synonyms and cases of mistaken identity.

641 Hamilton, R. A., Storey, W. B. and Fukunaga, E. T.
Two new macadamia nut varieties and an appraisal of the H.A.E.S. named varieties.
Circ. Hawaii Agric. Exp. Sta. 1952 : No. 36 : Pp. 5.

Details are given of the performance of five varieties on trial in Hawaii since 1948; two of the numbered clones also tested proved sufficiently outstanding to be named. Wailua comes into bearing earlier than any variety grown in Hawaii and gives heavy crops. Ikaiki also shows good bearing potentialities and produces vigorous and hardy growth. Both new varieties have desirable kernel and shell qualities.

642 Zohary, M.
On *Pistacia Saportae* and its occurrence in Palestine.
Nuovo G. Bot. Ital. 1949 : **56** : 233–35.

P. Saportae has been discovered in three stations in Israel. Phytogeographical and morphological considerations support the view that *P. Saportae* is a relic species in its own right and not a hybrid of *P. Lentiscus* x *P. Terebinthus*.

643 Messeri, A.
Descrizione di un pistillo di "*Olea europaea*" L. nel quale si sono sviluppate sacche polliniche. (**Description of a pistil of *O. europaea* in which pollen sacs have developed**).
Nuovo G. Bot. Ital. 1950 : **57** : 1–10.

A pistil is described in which one locule was normal while the other, together with the stylar tissue above it, had developed pollen sacs containing a normal tapetum and pollen grains.

644 Spina, P.
Osservazioni sulla morfologia e biologia del fiore dell'olivo in Sicilia. (**Observations on the morphology and biology of the olive flower in Sicily**).
Ann. Sper. Agr. 1952 : **6** : 635–50.

Data are given on date and duration of flowering and anthesis, on floral characteristics, on tendency to the formation of pseudodrupes and on suitability as pollinators for a number of Sicilian olive varieties.

645 Morettini, A. and Armellini, S.
Primo contributo allo studio delle varietà di olivo coltivate nella provincia di Ascoli Piceno. (**First contribution to the study of the olive varieties cultivated in the province of Ascoli Piceno**).
Ann. Sper. Agr. 1952 : **6** : 1092–1115.

An account is given of olive cultivation in this Italian province, with details concerning the varieties grown in different localities. Their self and intercompatibility were tested in a series of controlled pollinations, the results of which are reported. Detailed morphological descriptions are given of the varieties, the most popular of which is Carboncella; all of them proved self sterile and the most suitable pollinators are indicated.

646 Morettini, A. and Massacesi, A.
Il Leccio del Corno. Razza di olivo resistente alle basse temperature ed al *Cycloconium*. (**Leccio del Corno. An olive variety resistant to low temperatures and to *Cycloconium***).
Agricoltura Tosc. 1952 : **7** : 219–22.

In addition to the resistances in question, the olive variety described is distinguished by high and regular yields of oil of excellent quality. It is self sterile but sets well when pollinated with the common varieties grown in Tuscany (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2987).

647 Cadman, C. H. and Harris, R. V.
Leaf curl, a virus disease of raspberries in Scotland.
J. Hort. Sci. 1952 : **27** : 201–11.

The virus causing necrotic leaf curling of Norfolk Giant has been transmitted to numerous varieties by grafting, but is as yet confined to central Scotland. The disease is believed to be etiologically distinct from the analogous North American leaf curl and yellow blotch curl diseases.

648 Cadman, C. H. and Harris, R. V.
A lethal virus disease of Lloyd George raspberry in Scotland.
J. Hort. Sci. 1952 : **27** : 212–14.

The virus, named raspberry yellow blotch, also proved lethal on Burnetholm Seedling; other varieties infected showed leaf curling or mosaic.

649 Slate, G. L. and Klein, L. G.
Black raspberry breeding.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 266–68.

The progress of hybridization since 1911 at the New York State Agricultural Experiment Station, Geneva, is outlined. Many promising selections have been made from crosses involving either Bristol or Dundee; one hybrid between these two varieties has proved outstanding in recent trials.

In an attempt to combine the large size of the Sodus purple raspberry with the desirable fruit characteristics of black raspberries, Bristol was crossed with Sodus. The majority of the hybrids resembled the purple parent, but two large-fruited selections, 26694 and 26505, most nearly resembling the black parent, were backcrossed to nine agronomically desirable black types. Although several back cross progenies had large black fruits, these were too pubescent to be attractive, whereas those fruits with acceptable glossiness were no larger than the original black parents.

650 Lisavenko, M. A.
(Fasciation in the black currant).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 30–33. [Russian].

Stahanovka Altaja [Altaĭ Stahanovite], bred at the Altaĭ Horticultural Research Station from Goliath x Čempion Primorjja [Primorje Champion], developed coalescent fruits when grown in the Altaĭ and the Leningrad province. Previously, fasciation has been observed in Goliath. Fasciation is regarded as a symptom of shattered inheritance and of qualitative changes about to occur. Breeding black currants for large size by fixing the character of coalescent fruits is advocated.

651 Sergeeva, K. D.
(The seed viability and plant vigour of gooseberry and currant hybrids).
Agrobiologija (Agrobiology) 1952 : No. 4 : 123–25. [Russian].

At the Mičurin Horticultural Institute the hybrid Davison's Eighth x Lija Plodorodnaja [Productive Lia] produced more viable seed and more vigorous F_1 plants when the female parent was pollinated with a large amount than with a small amount of pollen.

In experiments with gooseberry, viable seed and healthy hybrids were obtained when Purman was pollinated with a pollen mixture of gooseberry hybrids showing resistance to *Sphaerotheca* or mixed pollen of Finik [Date] + Zelenyĭ Butyločnyĭ [Green Bottle] + Ranniĭ Geningsa [Henings' Early] + Maĭskiĭ Gercog [May Duke]. Of the crosses involving a single pollinating variety, only Purman x Finik gave a few F_1 plants. Some evidence is presented of the beneficial effects of supplementary pollination with mixed pollen and pollination with a large amount of such pollen upon seed viability and vigour in the combination Purman x (Finik + Zelenyĭ Butyločnyĭ + Industrija [Industry] + Careless).

652 Sergeeva, K. D.
(Russkiĭ, a new gooseberry variety resistant to *Sphaerotheca*).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : p. 74.

Russkiĭ [Russian] was obtained by pollination of the English variety Careless with mixed pollen of Štambovyĭ [Determinate], Haughton, Carry and Oregon, all showing resistance to *Sphaerotheca*. The initial shortcomings of Russkiĭ, e.g. malformed fruits and prostrate habit, have been largely overcome by Mičurinite training. The new variety is productive and its large dark oval fruits are of good flavour.

653 Darrow, G. M., Morrow, E. B. and Scott, D. H.
An evaluation of interspecific blueberry crosses.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 277–82.

Detailed reports are given of various interspecific hybrids produced at the North Carolina Agricultural Experiment Station. Crosses made between lowbush (*Vaccinium Lamarckii*) and highbush (*V. australe*) tetraploids to develop low growing types with desirable fruit quality have merely produced hybrids of intermediate height. Other tetraploid hybrids between dryland lowbush (*V. altomontanum*) and highbush varieties grow very low and produce large fruit, but the colour is unattractive. Promising drought resistant hybrids have been obtained from *V. australe* x *V. Myrsinites;* the seedlings were hardy and vigorous, and the fruit colour was black or very dark blue. Hybrids between the hexaploids *V. Ashei* and *V. Constablaei* have also proved hardy and vigorous; a few selections with fruit of good quality have been made. Vigorous pentaploid seedlings were developed from crosses between *V. Ashei* (6*x*) and *V. australe* (4*x*). Although the hybrids were self sterile, good crops were set in mixed plantings with both 6*x* and 4*x* parents; some selections have borne large fruit of high quality.

654 DOLCHER, T.
La meiosi e lo sviluppo del gametofito nell'ovulo di *Sambucus nigra* L. (Caprifoliaceae). [**Meiosis and gametophyte development in the ovule of *S. nigra* L. (Caprifoliaceae)**].
Caryologia 1952 : **4** : 58–76.

A detailed description is given for two botanical varieties, in both of which $n = 18$ and the embryo sac develops according to the *Adoxa* type, in which intercinesis is prolonged and germination is simultaneous with sporogenesis.

655 KRONENBERG, H. G.
Nieuwe aardbeirassen in West-Europa. (**New strawberry varieties in western Europe**).
Meded. Dir. Tuinb. 1952 : **15** : 343–54.

New strawberries in Great Britain, Belgium, Austria, Switzerland, Denmark, Sweden and Germany are described, with notes on the various research institutes at which they were bred and a table showing their individual suitability for freezing and preserving (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2989 and Vol. XX, Abst. 1153).

656 **Eden strawberry.**
Amer. Nurserym. 1952 : **95** : No. 11 : p. 38.

Eden has been released by the New York Agricultural Experiment Station as a variety suitable for processing. The fruits are of good size and retain their dark red colour after canning.

657 MORROW, E. B. and DARROW, G. M.
Effects of limited inbreeding in strawberries.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 269–76.

Data on selfing varieties, back-crossing S_1 selections to the parent variety and sib-crossing S_1 selections indicate that inbreeding reduces both plant vigour and fruit size. Inbreeding is, however, valuable for the selection and concentration of particular characters which can then be incorporated in other varieties by outcrossing.

658 Aardbei-onderzoek in de Bommelerwaard. (**Strawberry research in the Bommelerwaard district**).
Fruitteelt 1952 : **42** : 488–89.

Het aardbeiras "Bowa". (**The strawberry variety Bowa**).
Ibid. 1952 : **42** : p. 489.

As a result of Dutch efforts to obtain a strawberry with a better colour and firmer flesh than Deutsch Evern for the Bommelerwaard district, a promising new seedling No. 30, now registered as Bowa, has been selected for further testing.

659 FILIPČENKO, I. M.
(**An instance of heritable change in the strawberry**).
Agrobiologija (Agrobiology) 1952 : No. 3 : 131–35. [Russian].

Heritable changes were observed in some strawberries, including the variety Josif Mahomet at the Žerebkovskiĭ Agricultural Scientific Research Station. The new forms bore small fruits and were resistant to drought.

660 **New hardy strawberry.**
Amer. Nurserym. 1951 : **94** : No. 4 : p. 38.

The variety Red-Rich, from a cross between Fairfax and Wayzata, is claimed to be outstanding as regards its redness, sweetness and hardiness. It is reported to have survived a temperature of — 30° F, without the benefit of snow cover, and shown no noticeable winter injury. The variety is especially suitable for freezing and has good transportability. It was developed by M. Hagerstrom, Enfield, Minn., in cooperation with staff at the University of Minnesota.

661 MILLER, P. W.
Technique for indexing strawberries for viruses by grafting to *Fragaria vesca*.
Plant Dis. Reptr. 1952 : **36** : 94–96.

Further information is provided on the technique of graft-indexing with *F. vesca* (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 721).

662 ROY, R. S. and SHARMA, C.
Chromosome studies of Bihar bananas.
Indian J. Genet. 1951 : **11** : 211–14.

Cytological analyses of root tip cells have shown that most of the varieties commonly cultivated in Bihar are triploids ($2n = 33$). Under cultivation these varieties are sterile, but fertile pollen and viable seeds were produced by a local variety, Champa, in a grove neglected for

a few years; several triploid seedlings were recovered. Seeds collected from a wild banana in the Chotanagpur hills germinated at the Bihar Agricultural College and produced vigorous seedlings, which proved to be diploid ($2n = 22$); whereas Champa produces suckers 300 days after planting, the wild strain reached the suckering stage after only 80 days.
Disease resistance of the diploid has so far exceeded that of cultivated varieties.

663 SIMMONDS, N. W.
The strength of banana petioles in relation to ploidy.
Ann. Bot. 1952 : **16** : 341–47.

An analysis was made of leaf weight, breaking strength of the petioles in relation to leaf weight, and leaf index (length/breadth ratio) in diploid, triploid and tetraploid clones of *Musa acuminata*, *M. Balbisiana* and of the hybrids between these two species. Leaf weight increased from the diploid to the tetraploid condition. Whatever the chromosome number, *M. Balbisiana* bore heavier leaves than *M. acuminata*. Strength was measured as the breaking strength correlated by covariance for weight of the lamina. Strength declined with increase in chromosome number, the fall between diploids and triploids being greater than that between triploids and tetraploids. Differences between species were most marked at the diploid level. Chromosome number and leaf index did not appear to have a simple relationship. The practical significance of these results is discussed.

664 WALLACE, G. B.
Wilt or Panama disease of banana.
E. Afr. Agric. J. 1952 : **17** : 166–75.

It is mentioned that two local varieties in Tanganyika, Kinguruwe (Kimalindi) and Inanambo, are unaffected by *Fusarium* wilt; these varieties are not however popular among the natives. A further collection of East African varieties is under observation for wilt resistance.

665 TRAIL, G.
French hybrid grapes.
Amer. Fruit Gr. 1952 : **72** : No. 8 : p. 4.

In view of the interest of American growers in hybrids introduced from France, it is pointed out that many French hybrids are derived from crosses made by T. V. Munson more than 50 years ago between *Phylloxera* resistant winter hardy species native to Texas and European strains.

666 *HOCHBERG, N. and SAFRAN, B.
(Increasing the acreage of vineyards).
Hassadeh 1951 : **32** : 88–90. [Hebrew].

Descriptions are given of recommended wine and dessert grapes, with notes on adaptability and suitable stocks.

667 OLMO, H. P.
Breeding tetraploid grapes.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 285–90.

Comparisons are made between diploid varieties and their commercially successful autotetraploid forms. Preliminary results of selfing and crossing four diploid *Vitis vinifera* varieties and the autotetraploids derived from them show that inbreeding at the tetraploid level reduces vigour and yielding capacity much more than selfing diploids. Outcrossing to unrelated tetraploids, however, considerably enhances both vigour and fruit yield of tetraploids. Fruit setting capacity of tetraploids is also increased by interplanting diploids to serve as pollinators.

668 KUZJMIN, A. JA.
(The question of the development of biological properties in vine seedlings).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 40–42. [Russian].

Several instances of acquired changes in the dates of maturity and the quality of fruits (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 3001) observed in young hybrids and seedlings of vines are reported.

669 Reunión de técnicos agrícolas en la Estación Experimental de Mendoza. **(Meeting of agricultural research workers at the Mendoza Experimental Station).**
Inform. Invest. Agríc. (IDIA), B. Aires 1952 : **5** : No. 53 : 2–7.

Taxonomic investigations on vine varieties are reported. The crosses Bicane x Sultanina blanca [White Sultanina], Aluck x Sultanina blanca and Sanjuanina x tetraploid Sultanina Gigas have been made in an attempt to raise varieties with large seedless berries. New seedlings are being studied for resistance to phylloxera and eelworm.

---

* An extended summary of this paper is on file at the Bureau.

670 Neubauer, H. F.
Über ein ursprüngliches Vorkommen der wilden *Vitis vinifera* L. in Ost-Afghanistan. (**An authentic occurrence of wild *V. vinifera* L. in eastern Afghanistan**).
Mitt. höh. Bundeslehr- u. VersAnst. Wein-, Obst- u. Gartenbau Wien-Klosterneuburg, Bienenkunde Wien-Grinzing 1952 : **2** : 139–46.

A description is given of wild vines of *V. vinifera* occurring in Nuristan as part of the indigenous flora.

671 Čigrin, V. N.
(**Pressing tasks of northern viticulture**).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. **6** : 42–45. [Russian].

Hardy and early varieties of vine adapted to cultivation in the northern viticultural districts of the USSR, with pollinators for some female varieties, are listed. Several varieties and seedlings, including 19, 21, 23, 24, 31 and 32, are recommended for trial.

672 Kondrackiĭ, A. A.
(**Viticulture in the northern districts of the Ukrainian SSR**).
Vinodelie Vinogradarstvo SSSR (Winemaking Viticult. USSR) 1952 : No. **7** : 54–55. [Russian].

Several varieties, including Magarač 353, remarkable for its earliness, productiveness, large bunch and good quality grapes, which have done well in trials in northern Ukraine, are listed.

673 Kravčenko, P. A.
(**The cultivation of *Vitis amurensis***).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. **7** : p. 54. [Russian].

Seedlings of *V. amurensis* originating from the Primorje proved productive and hardy under the conditions of Krasnojarsk.

674 Vega, J.
Protección vitícola contra la "anguilulosis". (**Protection of the vine against eelworm attack**).
Inform. Invest. Agríc. (IDIA), B. Aires 1952 : **5** : No. 53 : 35–37.

Rootstocks resistant to *Meloidogyne incognito* in Argentina are listed.

675 Manzoni, L.
Malattie della vite. L'erinosi. (**Diseases of the vine. Erinosis**).
Ital. Agric. 1952 : **89** : 533–34.

This disease, caused by *Eriophyes vitis*, is one to which all European vines are susceptible in different degrees, and some direct producers are particularly so. Among the American vines, the cultivated varieties of *Vitis rotundifolia*, *V. Berlandieri*, *V. cinerea* and *V. cordifolia* are immune.

FORESTRY

676 Schreiner, E. J.
Genetics in relation to forestry.
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 23 January 1952, Wageningen : 449–55. (Mimeographed).

The general principles of forest tree breeding are outlined and the success of their application is illustrated by the results obtained from poplar hybridization in Maine. Promising fast-growing hybrids for pulpwood production in the northeast of the United States have been developed. The hybrids have been selected for resistance to diseases and pests under plantation conditions in Maine; they are now being subjected to direct inoculation tests for disease resistance. Attention has been given to branching habit; it has been possible to select some sparsely branched trees, the branches being of small diameter. Such trees will provide lumber or veneer lop with a minimum of small knots. Some information is also given on the plot methods for carrying out poplar sapling and crop tree tests, and also on the technique of controlled pollination of pines, including storage of the pollen.

677 Johnsson, H.
Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under år 1951. (**Annual report on the work of the Association for Forest Tree Breeding during 1951**).
Årsberätt. För. Växtf. Skogstr. 1951 : 3–18.

Ekebo Station

Using parents obtained from grafted material, numerous pollinations were carried out. They included: 27 crosses of pine, mainly between trees of southern and northern provenance; 8 crosses of larch, mainly interspecific hybridizations; a number of crosses between German and Swedish spruce; and some selfings of larch. Valuable breeding material of central European spruce, collected by C. L. Kiellander and G. Bergeås (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 774) in Austria, Switzerland, Belgium, France and Germany, should provide useful information about races of spruce and make it possible to raise cultivated forms of so-called

German spruce to meet the high standard of quality demanded.

Progeny trials of alder, ash, aspen, poplar, birch and oak were laid out in addition to 30,000 hybrid aspens raised in the nurseries. Measurements and other observations on the oaks have been published (cf. Abst. 683).

Hybrid progenies of alder, birch and aspen were raised in the greenhouse and cold frames; the birches were mainly derived from curly birch crosses of 1950, while the alder progenies, also dating from 1950, comprised seedlings of (*a*) *Alnus glutinosa*, *A. incana*, *A. rubra* and *A. hirsuta;* (*b*) interspecific hybrids, e.g. *A. glutinosa* x *A. rubra* and *A. incana* x *A. hirsuta;* and (*c*) triploid x tetraploid families.

In spring 1951, 25 alder crosses were made, consisting mainly of interspecific crosses and crosses of polyploid parents. From 16 different hybrid combinations in birch crosses, effected chiefly in order to obtain curly type offspring, only 0·8 kg. of seed was produced. In a study of methods of hybridization applied to elms, 13 crosses gave viable seed which, sown directly after harvest, gave 7000 plants.

Chromosome determinations were carried out on polyploid birch, alder and elm material.

Brunsberg Station

Seed from crosses of pine, spruce, birch and poplar was sown in the greenhouse, the pine hybrids being mainly from interspecific crosses involving *Pinus sylvestris*, *P. contorta* and *P. Banksiana*, while the poplar hybrids were chiefly crosses of *Populus tremula* and *Populus tremuloides*.

In spring 1951, 44 pine crosses were carried out on selected trees in various localities, on young grafted trees and on young trees of North American species. Field trials of pine and spruce were carried out in the province of Västmanland. A report on the older aspen experiments has already been published (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 3035).

Sundmo Station

Nursery operations were carried out on a large scale with seedlings of pine, spruce, birch and aspen. Four crosses of aspen were made. Work on conifer grafting in the open and on cuttings was continued (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 749).

Pine grafts flowered well in 1951 and provided material for crosses within the species *Pinus sylvestris* and for the combination *P. sylvestris* x *P. Murrayana*.

The physiological study of germination of pine seed transferred from one district to another in Norrland was continued.

678 **Ecology of American Forest Species, Erosion and Reafforestation. Organisation for European Economic Cooperation, Paris 1952** : Pp. 259.

Chapter IV deals with problems of choosing suitable species and provenance for the introduction of forest trees into northwest Europe from America, with particular reference to Sitka spruce, Douglas fir and *Quercus* spp.

679 KRAHL-URBAN, J.
Erbanlagen und Züchtungsmöglichkeiten bei Rotbuche, Stiel- und Traubeneiche. (**Hereditary constitution and breeding possibilities in *Fagus sylvatica*, *Quercus sessiliflora* and *Q. pedunculata***).
Z. Forstgen. Forstpflanzenz. 1952 : **1** : 114–20.

A review is given of published information concerning ecological races, the inheritance of flushing time, leaf coloration and shedding, vigour, growth form, bark characters, annual ring conformation, knots, suckering, tannin content, fertility and disease resistance, and its application in practical improvement. The opinion is expressed that hybrids between *Q. sessiliflora* and *Q. pedunculata* occur more frequently in nature than has been thought by some authors; and that in the majority of European forests the stronger growing forms have eliminated those of superior quality, a situation which can only be reversed by the application of breeding principles. The principal desiderata in breeding the species in question are enumerated. A study of the forests of Hesse and lower Saxony with the object of selecting plus trees has been undertaken, and the best methods of vegetative multiplication of the selected trees are being investigated.

680 LANGNER, W.
Waldbau und Forstpflanzenzüchtung. (**Sylviculture and forest tree breeding**).
Allg. Forstz. 1952 : **7** : 109–12.

The inadequacy of present sylvicultural methods for the improvement of German woodlands is pointed out, and the need for research on the effects of introducing plant material, obtained by breeding, into forest stands is discussed with reference to (1) possible applications of the results of studies in progress on selection of early and late shooting spruces, (2) the value of interspecific hybridization, and (3) the use of poplar clones for obtaining genetically uniform forest stands.

681 Clapper, R. B.
Breeding and establishing new trees resistant to disease.
Econ. Bot. 1952 : **6** : 271–93.

This review, concerned with the principles of forest tree breeding, deals particularly with the progress made in breeding forest and shade trees resistant to specific fungous diseases epidemic in North America.

682 Tucker, J. M.
Taxonomic interrelationships in the *Quercus dumosa* complex.
Madroño, S. Francisco 1952 : **11** : 234–50.

Two subspecies of *Q. turbinella* are described, one from California and the other from Lower California. The Californian subspecies intergrades with *Q. dumosa*. The form described as *Q. Alvordiana* appears to be a hybrid between *Q. turbinella* and *Q. Douglasii*, though it may be a self-perpetuating entity in some areas.

683 Johnsson, H.
Ungdomsutvecklingen hos stjälkek, druvek och rödek. (**Development in the young stage in *Quercus Robur*, *Q. petraea* and the red oak**).
Årsberätt. För. Växtf. Skogstr. 1951 : 19–44.
also Svenska SkogsvFören. Tidskr. 1952 : **50** : 168–93.

A provisional taxonomic classification and an analysis of growth characters in young trees of the above three species of oaks are recorded as a preliminary study of material forming part of a series of progeny trials in progress at the Ekebo experimental station.

684 Garrigues, R.
Sur un type particulier de noyau trouvé dans des Hyménoptérocécidies. (**On a special type of nucleus found in Hymenopteran galls**).
CR Acad. Sci. Paris 1950 : **231** : 984–86.

The resting nuclei of the galls produced by *Andricus curvator* and *Neuroterus baccarum* on *Quercus Robur* are characterized by the presence of rectangular bands of chromatin approximating in number to the n, $2n$ and $4n$ chromosome numbers of *Q. Robur*.

685 Pauley, S. S. and Johnson, A.
Aberrant silver maples.
J. Arnold Arbor. 1952 : **33** : 296–97.

Four distinct types with different degrees of abnormal chlorophyll development and with different habits of growth segregated in the progeny of a single tree of *Acer saccharinum*. In view of the failure to transmit the mosaic condition by budding or grafting, the aberrant types are believed to be genetic in origin.

686 Jarløv, H. C.
Varieteter af asp. (**Varieties of aspen**).
Nat. Verd., Kbh. 1952 : **36** : 149–52.

The giant triploid aspen, *Populus tremula* var. *gigas* ($2n = 57$) is described, with observations on its cytological origin and other characteristics. Swedish work on the production of polyploid forms of aspen by hybridization and by colchicine treatment is also mentioned.

687 Johnsson, H.
Avkommor av masurbjörk. (**Offspring of curly birch**).
Svenska SkogsvFören. Tidskr. 1951 : **49** : 34–45.

The content of this paper has already been reviewed from another journal (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 756).

688 Rohmeder, E.
Der geschlechtliche Dimorphismus als pflanzenzüchterisches Problem, dargestellt an den Wuchsleistungen männlicher und weiblicher Eschen. (**Sexual dimorphism as a plant breeding problem, as evidenced by the growth performance of male and female ash trees**).
Forstwiss. Zbl. 1949 : **68** : 680–91.

Observations in Germany have shown that ash trees with only staminate flowers were superior in height, diameter and volume production to "female" trees, which, in the experiment, included specimens with purely pistillate flowers, monecious trees and hermaphrodites. Long-term research on the subject has begun at the Forestry Institute at Munich. In the meantime, it is recommended that ash seed should be collected from selected trees which are of a desirable type and, if possible, progeny-tested, and also late and not too abundant seed producers.

The possible relations between metabolism and productivity in male and female forms in other species are also considered.

689 Cram, W. H.
Parent-seedling characteristics and relationships in *Caragana arborescens*, Lam.
Sci. Agric. 1952 : **32** : 380–402.

Comparisons made at the Forest Nursery Station, Indian Head, Sask., between 14 open-pollinated selections of *C. arborescens* and their seedling progenies resulting from selfing and open pollination have shown that factors determining seedling vigour and growth rate are inherited. A programme of selection, evaluation of combining ability and hybridization is therefore advocated to produce strains with improved vigour, suitable for shelter belt purposes.

690 Puri, G. S.
The amount of foliar ash in sal (*Shorea robusta* Gaertn.) trees of different quality classes in India.
J. Indian Bot. Soc. 1952 : **31** : 82–86.

An analysis of the mineral ash in mature leaves of *S. robusta* from different regions has revealed a correlation between tree quality, measured in terms of growth rate and form, and ash content. It is possible that trees of different quality may constitute distinct genotypes; further cytogenetical studies are therefore advocated.

691 Petrov, E. M.
(The large-fruited Crimean *Sorbus*).
Priroda (Nature) 1952 : No. **4** : 118–19. [Russian].

Wild forms of *S. domestica* found in the Crimea are regarded as good breeding material.

692 Kiellander, C. L.
Sortskillnader i 10-åriga fältförsök med svensk och mellaneuropeisk gran. **(Varietal differences in 10-year field trials with Swedish and central European spruces).**
Svenska SkogsvFören. Tidskr. 1951 : **49** : 282–301.

The subject of this paper has already been reviewed from other sources (cf. *Plant Breeding Abstracts*, Vol. XXII, Absts 771 and 774).

693 Stern, K.
Möglichkeiten zur Kennzeichnung von Differenzen in der Verteilung der Höhen bei Kiefernselektionsversuchen v. Wettsteins. **(Possibilities of detecting differences in the height distribution in v. Wettstein's pine selection experiments).**
Züchter 1952 : **22** : 180–89.

An examination of the figures obtained from v. Wettstein's plantations of single plant selections shows that average heights and the scatter taken together give all the information that a breeder requires to make selections, without unduly increasing the scale of the experiments and the complexity of the calculations. Comparisons between the means for the better and inferior progenies suggest that polymeric genes control the rhythm of growth increase as well as the final height attained.

694 Gothe, H.
Ein Kreuzungsversuch mit *Larix europaea* D.C., Herkunft Schlitz, und *Larix leptolepis* Gord. **(A crossing experiment with *L. europaea* D.C., Schlitz provenance, and *L. leptolepis* Gord.).**
Z. Forstgen. Forstpflanzenz. 1952 : **1** : 108–10.

The cones were larger when the Schlitz larch was crossed with the Japanese larch than when it was selfed or pollinated with other Schlitz larches. The seeds from selfing the Japanese larch gave a very low germination and those from selfing the Schlitz larch failed to germinate. The hybrid seeds germinated better when the Japanese larch served as seed parent; the seedlings also grew more vigorously in these early growth stages, though the reciprocals caught them up in the latter part of the first year.

The greatest variation in height of 1 year old trees was observed in the Japanese x Schlitz progenies, the least in the selfed progeny of the Japanese larch; both hybrid progenies displayed heterosis in comparison with the pure species. These differences were not correlated with the 1000 seed weight and are evidently genetic.

695 van Campo-Duplan, M. and Gaussen, H.
Sur quatre hybrides de genres chez les Abiétinées. **(On four intergeneric hybrids in the Abietineae).**
Bull. Soc. Hist. Nat. Toulouse 1949 : **84** : 95–109.

On the basis of comparative morphology and assuming that a considerable degree of pollen abortion may be taken as an indication of hybridity, *Tsuga longibracteata* is regarded as a hybrid of *T. chinensis* and *Keteleeria Evelyniana*, *T. Hookeriana* as a hybrid of *T. heterophylla* and *Picea sitchensis*, and *T. crassifolia* as a hybrid of *T. Hookeriana* and *P. Engelmanni*. *T. Jeffreyi*, believed to be a hybrid of *T. Hookeriana* and *T. heterophylla*, appears, however, to have good pollen.

696 Lücke, V. H.
Züchtungsversuche mit Kiefer (*Pinus silvestris*) und Lärche (*Larix decidua* Miller) in Niedersachsen. **[Breeding experiments with pines (*P. silvestris*) and larches (*L. decidua* Miller) in Lower Saxony].**
Z. Forstgen. Forstpflanzenz. 1952 : **1** : 74–7.

The method of selection of élite phenotypes of pine and larch is described as well as the method of grafting to obtain clones and the laying out of the clone plantations, with the ultimate aim of establishing seedling plantations which, when their genetic value has been ascertained, will be used for producing élite seed.

697 **Seek improvement of southern pine.**
Amer. Nurserym. 1952 : **96** : No. 2 : p. 72.

Fast growing seedlings of *Pinus Taeda*, *P. echinata* and *P. Strobus* are being selected from nurseries in the Tennessee valley for trial in the first stages of a long-term improvement programme.

698 Cummings, W. H.
Loblolly pine shows early differences with source of seed and locality of planting.
J. For. 1952 : **50** : 626–27.

Both height and percentage survival of two-year-old *Pinus Taeda* seedlings grown in eight localities in Alabama, South Carolina, Tennessee and Arkansas have shown consistent variation correlated with seed source, indicating the presence of distinct geographical races. Some strains show better adaptation to certain localities than others.

699 Schantz-Hansen, T. and Jensen, R. A.
The effect of source of seed on growth of jack pine.
J. For. 1952 : **50** : 539–44.

Pinus Banksiana seedlings grown from seed collected in 32 different localities in Canada and the USA have been grown under uniform conditions at Cloquet and Austin, Minn. Observations made since 1945 show that, in general, seedlings of northern origin grow more slowly than those from southern districts; the latter are, however, more susceptible to frost injury than northern types. Differences in size and form are apparent between seedlings of different origin, particular reference being made to a prostrate form which was obtained from the Atlantic coastal region of Maine; this type obviously constitutes a geographical race of *P. Banksiana*. Other distinct races, with good form and growth rate, are also distinguishable.

700 Christiansen, H.
A tetraploid *Larix decidua* Miller.
K. Danske Vidensk. Selsk. 1950 : **18** : 1–9.

A tetraploid plant of *L. decidua* has been discovered at the Gisselfeld estate, Sealand, Denmark. It shows some gigas characters but its economic value is as yet uncertain. Meiosis is fairly regular, but fertility is low.

701 Kanezawa, R.
Induced tetraploidy in Japanese cypress (*Chamaecyparis obtusa* Endl.).
Bull. Tokyo Univ. For. 1951 : **39** : 21–30. [from Rec. Res. Fac. Agric. Univ. Tokyo 1950–1951 (1952) : No. 1 : p. 65. (Abst.)].

A colchicine-induced tetraploid strain of *Ch. obtusa* is described; it shows several of the usual gigas characters.

702 Duffield, J. W.
Relationships and species hybridization in the genus *Pinus*.
Z. Forstgen. Forstpflanzenz. 1952 : **1** : 93–97.

Previous taxonomic arrangements of the genus are revised on the basis of compatibility relationships revealed by the interspecific hybridization programme carried out at the Institute of Forest Genetics, Calif. (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 3042). The scheme is compared with a similar method devised by Clausen for classifying angiosperms.

703 Bramble, W. C. and Byrnes, W. R.
Natural growth zones in Pennsylvania in relation to varietal testing of Douglas fir.
Progr. Rep. Pa Agric. Exp. Sta. 1952 : No. 81 : Pp. 4.

Seedlings of *Pseudotsuga taxifolia* var. *viridis*, var. *glauca* and var. *caesia* grown at the Pennsylvania State College Nursery from seed obtained from different parts of the USA and Canada are undergoing adaptability trials in each of the four zones into which Pennsylvania can be divided on the basis of climate, physiography and natural vegetation. It is hoped that some geographical races will prove particularly suitable for Christmas tree production in each of the zones.

VEGETABLES

704 **(Mass selection of vegetables on collective farms in the Gorjkiĭ province).**
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 7 : 55–58. [Russian].

Carrot. Bolgarskaja [Bulgarian] and Nantes have been improved by selection.

Onion. Material with good economic properties has been selected from Arzamasskiĭ, Višenskiĭ and Novolikeevskiĭ Želtyĭ [Yellow Novolikeevskiĭ]. It is hoped to obtain a new uniform vigorous variety resembling the female parent from Muromskiĭ [Murom] x Višenskiĭ.

Cucumber. Ržavskiĭ Mestnyĭ 294 [Local Ržavskiĭ 294] has been improved. It bears fruits that are only slightly ridged and do not turn yellow when ripe.

705 Krasočkin, V.
(New varieties of vegetables for the collective farms of the north).
Kolhoznoe Proizvodstvo (Collective Farming) 1952 : No. 8 : 54–55. [Russian].

Several varieties of vegetables which have been developed in recent years at the USSR Institute of Plant Industry are listed.

Beet. Puškinskaja Ploskaja [Puškin Flat] and Leningradskaja Okruglaja [Leningrad Round] are early and productive varieties with good keeping properties and show resistance to bolting. Of the new forage beets, Okruglaja Saharnaja [Round Sugar], remarkable for its high sugar content, is the most promising.

Carrot. Leningradskaja [Leningrad] has a high content of vitamin A.

Radish. Virovskiĭ Belyĭ [VIR* White] and Virovskiĭ Rozovyĭ [VIR Pink] are productive and show resistance to bolting.

Cabbage. Zolotoĭ Gektar 1432 [Golden Hectare 1432] shows resistance to split stem and is more productive than Nomer Pervyĭ [Number One]. It reaches maturity 3–5 days later than that variety. Another new white cabbage Ladožskaja DS–8395 [Ladoga DS–8395] is remarkable for its resistance to club root and cabbage fly. It is a mid-season type producing firm heads of good quality. Osennjaja [Autumn], also a mid-season variety, is still under trial.

Tomato. Puškinskiĭ [Puškin] and Urožaĭnyĭ [Productive] are hardy and early outdoor varieties. The best new tomatoes for indoor cultivation are Brežneva 1804 [Brežnev's 1804] and Tepličnyĭ VIR 1805 [Glasshouse VIR 1805]. They are early mid-season types with large fruits and show resistance to diseases.

706 Bryzgalov, V. A., Ordynskiĭ, V. V. and Černetčenko, V. S.
(The work of the scientists in 1952).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 63–66. [Russian].

Breeding work with vegetables and cucurbits in the Leningrad and Gorjkiĭ provinces and the Ukraine is outlined.

The breeding methods at the Gorjkiĭ Agricultural Institute include vegetative hybridization of cabbage, garlic, tomato and melon, and multiparental cross pollination of carrot, onion, cabbage and cucurbits. Mention is made of individual selection of the tomato Pečorskiĭ 278 [Pečora 278] and of a cucumber which is being bred for hardiness.

Mičurinite breeding of cucurbits at the various Ukrainian institutes is reported. The aims include earliness and good keeping properties. Several cultivated varieties are being improved. Mention is made of a gourd Dnepropetrovskaja Kustovaja [Dnepropetrovsk Bush], bred from the gourd Mozoleevskaja x the eggplant Grečeskiĭ [Greek]. It yields 700 to 750 c. per ha. and has a habit which makes mechanical cultivation easy. Breeding is in progress to obtain a water melon with a similar compact habit. Vegetative rapprochement is used for overcoming incompatibility between the material involved in the crosses.

707 Pförtner, K.
Welche Anforderungen stellt die Konserven-Industrie an Anbau und Züchtung zur Qualitätsverbesserung der Rohware? **(What are the special requirements of the conserving industry regarding growing and breeding for improved quality of the raw product?)**
Landw. Forsch. 1952 : 2. Sonderheft : 88–93.

The speaker defined the characters required in canning peas, beans, carrots, celery, spinach and various brassicas. The most suitable existing varieties are named.

708 Sneep, J.
Enige ervaringen met kruisbestuivende tuinbouwgewassen op het gebied van rassenonderzoek en veredeling. **(Some experiences with cross-pollinated horticultural plants in relation to research on varieties and breeding).**
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 20 February 1952, Wageningen : 470–72. (Mimeographed).

Much of the substance of this paper has already been reviewed from another source (cf. Abst. 598). The speaker pointed out how the effects of variation in vegetables may be favourable or unfavourable, depending on the time of harvesting appropriate to a particular crop. Degeneration and low seed production in vegetable crops and the difficulty of analysing qualitative characters on a mathematical basis are mentioned. In general, horticultural crops must be judged by appearance. Other subjects touched on were: differences between reciprocal crosses and the possibility of obtaining sufficiently uniform seed from reciprocals in cabbage; and the use of diseased bumble bees in effecting reciprocal crosses.

---

* Vsesojuznyĭ Institut Rastenievodstva [USSR Institute of Plant Industry].

709 MALHEIROS-GARDÉ, N. and GARDÉ, A.
Contribução para o estudo cariológico da família "Umbelliferae". II. **(Contribution to the caryological study of the family Umbelliferae. II).**
Genet. Iber. 1951 : **3** : 23–35.

An examination of the chromosomes of 15 Portuguese species has enabled the authors to report chromosome numbers for certain species not previously counted, to confirm published numbers for some species and to correct the figures for others; these included $n = 11$ for *Daucus muricatus*, previously published as $n = 16$.

710 Forsøg med stammer af gulerødder til foderbrug. 1949–1950. **(Trials with strains of carrots for fodder. 1949-1950).**
Tidsskr. Planteavl 1952 : **55** : 539–42.

In trials of 14 Danish strains of carrot varieties the following were certified as first class: three strains of James—Roskilde, Halvlange Dæhnfeldt [Semilong Dæhnfeldt], Lange Hinderupgaard [Long Hinderupgaard]; two strains of Lobbericher—Dæno and Asco; and two strains of Champion—Dæno and Asco. Champion Dæno (= Voldstrup) gave the highest average yield of dry matter per ha. from the roots, but the lowest from the tops; its yield of roots with a low dry matter content was also high.

711 FUKUSHIMA, E.
(An instance of structural hybridity in the radish).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 7–8. [Japanese].

Continuing his researches on the causes of sterility in Japanese radish varieties (cf. *Plant Breeding Abstracts*, Vol. VIII, Abst. 975), the author describes the meiotic behaviour of a structural hybrid isolated from his breeding material.

712 MARČENKO, I. I.
(Hybrids between the Jerusalem artichoke and sunflower).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. **5** : 74–75. [Russian].

Crosses between *Helianthus tuberosus* and *H. annuus* at the Stavropolj State Breeding Station and the Institute of Genetics and Breeding of the Ukrainian Academy of Sciences, Harjkov, are reported. At Harjkov many hybrids of the first and second generation have been tested and a productive clone, 120, selected. It yielded three times as many tubers as the standard Jerusalem artichoke Belyĭ Kievskiĭ [White Kiev] and the sugar content was appreciably higher. The stems also yielded 10–15% sugar.

713 JONES, H. A. and PETERSON, C. E.
Complementary factors for light-red bulb color in onions.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : p. 457.

The inheritance of bulb colour has been studied in the F_1 and F_2 of crosses between the yellow Brazilian inbred Pêra Baía and three yellow varieties of American origin, Early Yellow Globe 2135, Ebenezer 9166 and Yellow Globe Danvers 15–518. All the F_1 progenies had light red bulbs, and each F_2 showed segregation of light red and yellow types in the ratio 9 : 7. These results support the hypothesis of Clarke *et al* (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 765) concerning interaction of three pairs of complementary factors determining bulb colour.

714 SCHULTZ, J. H.
Onion types and varieties for North Dakota.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1952 : **14** : 144–50.

The results of adaptability trials during three seasons are summarized and several long-day varieties of the Sweet Spanish and storage types are recommended. Short-day varieties produced very small bulbs of poor keeping quality. Among the hybrid onions, Asgrow Y 41 and Asgrow Y 43 proved promising.

715 ABE, S., KATSUMATA, H. and KANKI, H.
(On poor strains of the Senshuki onion due to lack of selection).
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 103–09. [Japanese].

Interstrain differences in the yielding capacity and tendency to bolt of the Senshuki [Izumi Yellow] onion, a selection of Yellow Danvers, have been shown to be due to lack of selection in some seed growing areas.

716 ANGULO CARPIO, M. D.
Aportaciones para el estudio de variaciones cromosómicas inducidas por ultrasonidos. II. Acción sobre mitosis de *Allium Cepa*. **(Contributions towards the study of chromosome variations induced by ultrasonic waves. II. Action on mitosis in *A. Cepa*).**
Genet. Iber. 1951 : **3** : 113–28.

In continuation of the previous experiments (cf. Abst. 762), the same treatment was applied to root meristems of *A. Cepa*. The effect of the treatment consisted in marked agglutination of the chromosomes and its various consequences, the most frequent of which are described and illustrated. In extreme cases complete disintegration of the chromatin was observed; in others, c-mitosis with formation of 4*n* cells occurred. Thus the action of ultrasonic waves in some ways combined the effects usually associated with physical and chemical mutagenic agents respectively.

717 KEHR, A. E.
Soluble solids and their determination in onions.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 110.

Selection for total solids content in the onion Creole has resulted in a highly pungent strain especially suitable for storing and dehydration (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 3056). A technique of determining total solids content on the basis of specific gravity estimations is being devised; it is equal in accuracy to the much slower refractometer method.

718 WARID, W. A.
Inheritance of soluble solids in the onion *Allium cepa* L.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 110.

Data from the cross Red Creole x Calred suggest that inheritance of percentage of soluble solids is quantitative, with geometric gene action and partial dominance of low percentage. Possibly four to ten pairs of factors are involved in the difference between the two parents. Selection for high or low content of soluble solids would be effective with heritability values of 71–73% and 76–81%, respectively. Percentages of dry matter and soluble solids were positively and significantly correlated.

719 ULLMAN, H.
(The rearing of onions).
Hassadeh 1951 : **32** : 77–79. [Hebrew].

The development of onion growing in Israel is recounted. Breeding with a view to providing a succession of crops began at Acre in 1947. Early Spanish, which has a short dormancy period, was crossed with the Syrian variety Hama. The resulting hybrid could be stored till January. At Neveh Ya'ar, where the same hybrid was grown on a larger scale, selected strains could be stored till April. Trials with Australian Brown and Far Eastern varieties were not satisfactory. A selection that could be stored for a year or more was made from a sample of Far Eastern seed, the exact source of which is not known. Seed from these selected bulbs was grown and has been named Type B. Hybridization of Type B with Early Spanish is under way. Also under way is a search for strains with better storage qualities among Early Spanish onions.

Allium fistulosum, which is susceptible to mildew, has been crossed with Early Spanish, which is resistant to mildew and, to a lesser degree, to thrips.

720 CLARKE, A. E., POLLARD, L. H. and HAWTHORN, L. R.
Effect of time of seeding on the winter survival and subsequent seed stalk development of onions.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 439–44.

Data on the performance of varieties at the Utah Agricultural Experiment Station since 1945 show that differential varietal response to severe winters is influenced by the date of planting. The best times for planting particular varieties intended for bulb development or seed production in northern Utah are indicated.

721 COCHRAN, F. D.
Methods of breeding shallots.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 109.

Methods of shallot breeding at the North Carolina State College are briefly outlined. Results from the cross *Allium ascalonicum* x *A. fistulosum* and the reciprocal suggest that cytoplasmic influence is responsible for the production of unreduced gametes of the former species. The perennial habit of *A. fistulosum* has shown dominance in the hybrid and is probably dependent upon two complementary factors.

722 DIANNELIDIS, T.
Cytologische Studien an einigen *Allium*-Arten aus nord-Griechenland. **(Cytological studies on some *Allium* species from northern Greece).**
Portug. Acta Biol. 1951 : **3** : 151–70.

An account is given of chromosome studies in five Greek species of *Allium*, all of which proved diploid, with $n = 8$. In *A. fuscum* occasional meiotic irregularities were observed. *A. stamineum* was more regular but some 10% of the pollen grains were nonviable owing to the presence of micronuclei. *A. margaritaceum* showed morphological variation in its idiogram but few meiotic irregularities; no tetraploid forms such as have been described by Mensinkai (cf. *Plant Breeding Abstracts*, Vol. X, Abst. 312) were found. *A. meteoricum* had a distinctive idiogram. The fifth species studied was *A. sphaerocephalum*.

Considerable variation in the SAT zones was observed in all the species, even from cell to cell within an individual, and characteristics of the SAT chromosome are considered of doubtful value for systematic purposes.

723 KURITA, M.
(Satellite chromosomes in some species of *Allium*).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : p. 24. [Japanese].

Observations are recorded on the morphology of the satellite chromosomes of a series of Japanese species.

724 ALEKSEEVA, M. V.
(Some species of *Allium*).
Agrobiologija (Agrobiology) 1952 : No. 3 : 60–74. [Russian].

Experiments at the Umanj Agricultural Institute, Kiev province, suggest that the classification of *A. sativum* into bolting and nonbolting subspecies is unjustified, because these characters depend on internal and external conditions determining the phasic development of the buds. Similarly, the differences between *A. Porrum* and *A. Ampeloprasum* are attributed solely to differences in phasic development, and, therefore, it is proposed to designate both forms as *A. Porrum*.

725 SCARAMUZZI, F.
Note genetiche e pratiche per la selezione del finocchio dolce. **(Genetic and practical notes on the breeding of sweet fennel).**
Riv. Ortoflorofruttic. Ital. 1952 : **36** : 113–22.

In continuation of previous studies on sweet fennel (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 2205), the author discusses aims in improving the existing varieties of *Foeniculum vulgare* in cultivation and then sets out the results of experiments on the inheritance of the size of the swollen leaf base in artificially selfed progenies. It appears that this character is very probably determined by a number of factors with cumulative effect.

The respective merits of mass selection and pedigree selection of superior strains as methods of breeding are considered.

726 YAMASAKI, M. and NAKAUSA, T.
[Identification of some polyploid strains of crop plants by treatment with potassium chlorate (preliminary report)].
Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 73–75. [Japanese].

Tetraploid strains of *Raphanus sativus* and *Brassica pekinensis* could be distinguished from the corresponding diploids by immersing the petioles of detached leaves in a dilute $KC10_3$ solution. The tetraploids were adversely affected to a much greater degree than the diploids.

727 ČULKOVA, E. I.
(New varieties of cabbage).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. 6 : 62–63. [Russian].

Descriptions are given of Belorusskaja 85 [White Russian 85], Jubileĭnaja 29 [Jubilee 29] and Lošickaja 96, recently developed at the White Russian Horticultural Research Station.

Belorusskaja 85 is a productive mid-season variety selected from a local population. It produces firm heads keeping until April.

Jubileĭnaja 29, from Belorusskaja 85 x Slava 1305 [Glory 1305], produces large heads with a high content of solids. It is a mid-season variety of good transportability with economic characters similar to Belorusskaja 85.

Lošickaja, which is still under trial, is as productive as Kolhoznica [Collective Farmer] and Copenhagen Market, but is not as early as Nomer Pervyĭ [Number One].

728 MOORE, J. F.
A study of field plot technique with sprouting broccoli.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 471–74.

Data are presented on field experiment studies carried out at Puyallup, Wash., to determine plot size, shape and number of replicates adequate for analyses of variance with respect to yield and response to cultural treatments. Plots three rows wide had the lowest coefficient of variation. In order to demonstrate significant differences as high as 10% of the mean, five replicates of about 100 plants each were necessary.

Considerable genetic variability was found in the Medium Ferry Morse strain, the coefficient of variability being 43·29.

729 Katayama, M.
(Sex determination in spinach).
Idengaku Zasshi/Jap. J. Genet. 1949 : **24** : 12–14. [Japanese].

Sex ratios were ascertained for two spinach varieties grown under various photoperiods. In both cases it was observed that the proportion of male plants was least under short photoperiods and increased when the period of illumination was lengthened.

730 Pound, G. S. and Cheo, P.-C.
Studies on resistance to cucumber virus 1 in spinach.
Phytopathology 1952 : **42** : 301–06.

Analyses of F_1 and F_2 progenies from virus resistant Virginia Savoy crossed with susceptible varieties such as Nobel, Viroflay and Prickly Winter indicate that resistance is controlled by a single dominant gene. Whereas in Nobel tissues the virus concentration increased with rising air and soil temperatures, and accompanying disease symptoms became increasingly severe, no virus was recovered from inoculated Virginia Savoy and no disease symptoms were observed below 28° C; at this temperature, however, the resistance of Virginia Savoy broke down and systemic necrosis occurred at the apical meristem. Results suggest that the substance inhibiting virus development in Virginia Savoy is ineffective at 28° C. An inhibitory substance was also extracted from diseased and healthy Nobel tissues; although this substance failed to inhibit development of the virus inhabiting Nobel tissues, it was effective in preventing multiplication of cucumber virus 1 obtained from tobacco.

731 Harrington, J. F. and Thompson, R. C.
Effect of variety and area of production on subsequent germination of lettuce seed at high temperatures.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 445–50.

Seed of 12 varieties from nine growing areas in California and Arizona was germinated in darkness at 24, 26, 28 and 30° C at the Plant Industry Station, Beltsville, Md. Varietal differentiation in respect of percentage germination was most marked at 26° C; in 1948 Imperial 456 and Imperial 17 showed over 80% germination at this temperature, whereas Imperial 615 showed only 33%. The region of the seed source also influenced the germination capacity of all varieties. Highly significant positive correlations were found between germination percentage and temperature experienced 10–30 days preceding harvest.

732 Batra, S.
Induced tetraploidy in muskmelons.
J. Hered. 1952 : **43** : 141–48.

Tetraploids of nine *Cucumis Melo* varieties, Golden Gopher, PB13A, PB13S, 47–9–8, Banana, Delicious, Hale's Best, Resistant 6 and V–1, induced by 0·4% colchicine treatment at the cotyledon stage, have been studied cytologically and compared with the original diploids. Frequent quadrivalents and occasional trivalent and univalent configurations were observed at meiosis in the tetraploids, but no consistent relationship was established between the frequency of quadrivalents and the percentage of viable pollen. All tetraploids were less self fertile than the diploids but were equal to the diploids in cross compatibility. Although 4*n* fruits contained fewer seeds than those of diploids, sufficient numbers were available for subsequent planting. With respect to stem thickness and size of flowers, pollen and stomata, the 4*n* plants exhibited the gigas characteristics typical of most autotetraploids, but the mature 4*n* plants were of more compact growth habit and produced somewhat smaller and less elongate fruits than the 2*n* parents. With the exception of the 4*n* strain of Golden Gopher, all tetraploids were less productive than their 2*n* parents. The quality of all 4*n* fruits was, however, judged superior to that of the diploids, indicating that chromosome doubling may become a useful method of developing improved varieties.

733 Johnstone, F. E.
Observation of a Japanese seedless watermelon.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 108–09.

Comments are made on the performance of triploid water melon plants raised from seed introduced from Japan. On the average six mature seeds were found in a well-developed fruit; the undeveloped seeds were not noticeable in eating.

734 Taylor, J. C., Hawthorne, P. L. and Webb, R. E.
Calhoun Sweet, a wilt resistant watermelon.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 108.

The water melon Calhoun Sweet has been developed at the North Louisiana Experiment Station from a cross between Dixie Queen and a selection of the Kleckley Sweet type. Resistance to *Fusarium niveum* is its most valuable character. It has also shown considerable resistance to anthracnose.

735 Makarovskiĭ, A. F. and Podmogaeva, M. I.
(Interspecific pumpkin hybrids).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. **6** : 48–55. [Russian].

Breeding pumpkins at the Birjučiĭ Kut Breeding Station included interspecific multiparental hybridization involving *Cucurbita maxima*, *C. Pepo* and *C. moschata*. Hybrids 135, 136 and 137, obtained by this method, produced healthy viable seed.

Hybrid 135, from Hybrid 75 x Kustovaja 39 [Bush 39] and Birjučekutskaja 644 [Birjučiĭ Kut 644] produced small pinkish yellow fruits with green patches.

Hybrid 136, from Belaja Medovaja 611 [White Honey 611] x (Kustovaja 39 + Birjučekutskaja 644), gave F_1 plants with fruits of *C. moschata* type and one plant with those of *C. maxima* type. The former weighed 2·7–17·3 kg. and had pinkish-cream skin and thick yellow flesh. The individual of the *C. maxima* type produced 2 large round fruits weighing 36 kg. The skin of these fruits was grey, and they contained more seed than the fruits of the *C. moschata* type.

Hybrid 137, from Birjučekutskaja 628 x (Belaja Medovaja 611 + Mindaljnaja 35 [Almond 35]), produced two plants of the *C. moschata* type with many oblong ridged pinkish-cream fruits weighing 50 kg. each.

736 Kumar, L. S. S. and Vishveshwaraiah, S.
Sex mechanism in *Coccinia indica* Wight and Arw.
Nature, Lond. 1952 : **170** : 330–31.

Evidence has been obtained that the male plant of the above species is heteromorphic for the sex chromosomes. The gynodiecious form is similar to the normal diploid female in chromosome constitution (22A + XX) but is highly sterile. A male triploid with 33A + XXY chromosomes was discovered.

737 Dyrkningsforsøg med stammer af asieagurker 1946–50. **(Cultivation trials with strains of large cucumbers for preserving 1946–50).**
Tidsskr. Planteavl 1952 : **55** : 554–56.

In trials held at four different centres in Denmark, 24 strains of Danish origin were tested for yield, size and quality of the cucumbers produced and for hardiness under unfavourable conditions of soil and climate. Five strains of Dansk Asie [Danish Large Preserving], five of Langelands Kæmpe [Langeland Giant], two of Ideal, and one of Ideal Nova were successful and were certified as meriting the designation II.

738 Vinnik, A. G. and Vetušnjak, L. F.
(Intravarietal hybridization of the cucumber).
Agrobiologija (Agrobiology) 1952 : No. **4** : 125–31. [Russian].

At the Ukrainian Horticultural Institute intravarietal hybrids of Berlizovskiĭ and Nežinskiĭ 12 grew more vigorously, developed more uniformly, produced better quality fruits and were earlier and more productive than the initial material.

The intravarietal crosses of Berlizovskiĭ involved (1) direct and reciprocal crosses between élites grown at the Skvir and the Dnepropetrovsk Breeding Stations, (2) pollination, with or without self pollen, of élites grown in different years at Skvir, (3) pollination of élites at Skvir or Dnepropetrovsk with mixed pollen from Skvir and Dnepropetrovsk, and (4) direct and reciprocal crosses between Skvir élites, multiplied at Stalino and Dnepropetrovsk.

The intravarietal hybrids of Nežinskiĭ 12 were obtained in similar ways.

739 Brežnev, D. D. and Aleksandrov, S. V.
(A new method of growing the seed of glasshouse varieties of tomato and cucumber).
Sad i Ogorod (Fruit and Vegetable Gardens) 1952 : No. **6** : 54–60. [Russian].

The heritable properties of the seed of the indoor varieties of tomato, Osenniĭ 205 [Autumn 205], Tepličnyĭ Brežneva 1804 [Brežnev's Glasshouse 1804] and Rozovoplodnyĭ 1642 [Pink-fruited 1642], which were bred at the USSR Institute of Plant Industry, were improved by raising the seed out of doors. The improved material yielded more early and late maturing fruits. The beneficial effects of outdoor cultivation upon productiveness of the seed were most marked when the seed was raised in Kazahstan. Similar results were obtained with the indoor cucumbers Klinskiĭ 1545 and Leningradskiĭ Tepličnyĭ 23 [Leningrad Glasshouse 23].

740 Sill, W. H. (Jun.) and Walker, J. C.
A virus inhibitor in cucumber in relation to mosaic resistance.
Phytopathology 1952 : **42** : 349–52.

Both healthy cucumber plants and those infected with cucumber virus 1 contain a substance highly inhibitive to this virus. It is postulated that the inhibitor has an effect upon the increase of the virus, or alters the influence of the virus on the metabolism of the plant. In healthy individuals the inhibitor is apparently as abundant in resistant as in susceptible plants, but infected plants contain less inhibitor and more measurable virus than resistant plants. Conversely, the more resistant a variety the more difficult it is to recover the virus, because of its closer association with the inhibitor. It was not possible to determine the exact relation between the inhibitor and resistance; an approximate inverse correlation was however obtained between the amount of chlorotic tissue, in which inhibitor content was low and virus concentration high, and the degree of resistance exhibited by a variety.

741 MACKINNEY, G. and JENKINS, J. A.
Carotenoid differences in tomatoes.
Proc. Nat. Acad. Sci. Wash. 1952 : **38** : 48–52.

In a previous paper the genotypes *RR TT*, *rr TT* and *RR tt* were proposed for the red, yellow and tangerine types of fruit (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 2966). The present paper gives the results of spectroscopic and chromatographic analyses of heterozygous red-fruited tomatoes (*Rr Tt*, *RR Tt* and *Rr TT*), heterozygous yellow fruits (*rr Tt*) and the double recessive form (*rr tt*), in comparison with the parent strains. The double recessive fruit synthesizes prolycopene; it forms more total carotenoid than the yellow but considerably less than the red and tangerine types; the latter are approximately equal in production of total carotenoid.

742 PORTER, J. W. and LINCOLN, R. E.
I. *Lycopersicon* selections containing a high content of carotenes and colorless polyenes. II. The mechanism of carotene biosynthesis.
Arch. Biochem. 1950 : **27** : 390–403.

From crosses involving *L. esculentum*, *L. pimpinellifolium* and *L. hirsutum* inbred selections with a high content of carotenes and colourless polyenes have been developed. It is suggested that such selections provide valuable material for the study of biosynthetic processes. It is assumed that the parents differ at more than two loci for the biosynthetic processes in question, and that therefore the selections represent various stages in the synthesis of the compound forming the end product. A scheme for the biosynthesis of carotenes in the tomato is presented. The order of the compounds involved has been established on the basis of chemical structure; evidence for the direction of the reactions has been supplied by analysis of the inheritance of key compounds (cf. *Plant Breeding Abstracts*, Vol. XIX, Abst. 2966 and Vol. XX, Abst. 1963). Three types of reaction are involved in the postulated scheme: dehydrogenation, ring formation and oxidation. It is further suggested that the scheme is valid for all yellow and red fruits and vegetables containing carotenes.

743 HAZINA, E. P.
(Repeated back grafting as a method of intensifying changes in the heritable characters of plants).
Doklady Vsesojuz Akad. Seljsk. Nauk im. V.I. Lenina (Proc. Lenin. Acad. Agric. Sci. USSR) 1952 : No. 6 : 9–11. [Russian].

The tomato Humbert became earlier and produced more and larger fruits at the USSR Institute of Breeding and Genetics when grafted on nightshade. The effects of grafting were intensified when the first, second, third and fourth seed generations were each grafted again on nightshade stocks.

744 BALDIN, P. G.
(Vegetative hybridization of the tomato).
Agrobiologija (Agrobiology) 1952 : No. 4 : 142–45. [Russian].

At Moscow, new varieties of tomato were obtained by an improved method of vegetative hybridization which increases the compatibility between the stock and scion and intensifies the influence of the stock.

PGB [P. G. Baldin] was developed by grafting Budennovka [Budennyĭ] on John Baer, sowing the seed from the second cluster of the scion, grafting the first seed generation on a John Baer stock and continuous selection. PGB is remarkable for its good fruit set and compact cluster. The fruits are orange-red, round, smooth, large and with flesh of good flavour.

Moskovskiĭ Ljubimec [Moscow Favourite] was obtained in the same way by grafting Lučšiĭ iz Vseh [Best of All] on PGB. It is more productive and bears larger fruits than Lučšiĭ iz Vseh.

745 PRAKKEN, R.
Entproeven met tomaat. (**Grafting experiments with tomato**).
Studiekring voor Plantenveredeling (Plant Breeding Study Circle) 20 February 1952, Wageningen : 442–45. (Mimeographed).

Reciprocal grafts between the tomato varieties Sunshine and San Marzano, at the Laboratory of Genetics, Wageningen, provided no evidence of any effect of the stock upon the hereditary nature of the scion.

746 LARSON, R. E. and POLLACK, B. L.
The interactions of planting dates and strains as measured in maturity and productivity of tomatoes.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 378–83.

On the basis of weekly yields throughout the harvesting period the relative earliness of six varieties and hybrids has been shown to vary with the planting date at the Pennsylvania State College. Thus, where early maturity is the criterion for selection, a single trial is inadequate. Each variety gave a consistent total yield, however, regardless of planting date.

747 SEN, N. K.
Isochromosomes in tomato.
Genetics 1952 : **37** : 227–41.

Cytological observations on isochromosomes composed of either two long arms from chromosome 9 or of two long arms from chromosome 8 are reported. The isochromosomes appeared in F_1 mutants obtained from plants whose pollen had been treated with formaldehyde or ammonia vapour. The isochromosomes were unusual because each replaced a normal member of the diploid complement. In the later meiotic stages the isochromosomes of both types of disomics and of 9L–9L secondary trisomics behaved typically, forming configurations which included ring univalents, heteromorphic bivalents and ring trivalents. Internal pairing of the isochromosomes was much more frequent than fraternal or internal-fraternal pairing. The normal homologue of either isochromosome exhibited nonhomologous association in its chromatin zones. During pachytene the centromeres of the internally paired isochromosomes were very often subterminal. It is suggested that this subterminal location may be due to resistance of the centromere to mechanical distortion, rather than to a slight difference in homology between the arms or to nonhomologous association. Isochromosome 9L–9L was only transmitted when the disomic mutant formed the female parent. In the selfed progeny of this form, disomics occurred at a rate of less than 1%, secondary trisomics at a rate almost ten times greater. Selfing the secondary trisomic type resulted in about 20% secondaries and 2% primaries. Infertility prevented study of transmission of isochromosome 8L–8L.

748 SCHULTZ, J. H. and KELLY, E.
A study of ascorbic acid content and fruit size in tomatoes segregating for those characters.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 458–62.

Analyses of ascorbic acid content and fruit size were carried out at Fargo, N. Dak., using two segregating F_2 populations, designated NH 200–49 and NH 224–49, obtained from the University of New Hampshire. High ascorbic acid content was inherited from *Lycopersicon peruvianum* and large fruit size from commercially desirable varieties. When both F_2 populations were combined there was no significant correlation between the two characters. A negative correlation (— 0·208) between ascorbic acid and fruit weight was observed in the NH 200–49 population; the other population showed no significant correlation. In both populations, however, individuals with relatively high ascorbic acid content and large fruit size were found, suggesting that breeders making selections for acceptable fruit size need not necessarily sacrifice ascorbic acid content.

749 **Scientists cross wild and tame tomatoes to get more vitamins.**
Crops & Soils 1952 : **4** : No. 9 : p. 29.

Crosses undertaken at Purdue University, Ind., between wild species and commercial strains have given rise to an orange coloured tomato containing 10–12 times more vitamin A than commonly grown varieties. Selection for high quality and uniformity is in progress. Similar crosses have also produced strains containing twice the usual amount of vitamin C; these are suitable for canning.

750 RICK, C. M.
The grafting relations of wilty dwarf, a new tomato mutant.
Amer. Nat. 1952 : **86** : 173–84.

The above mutant, due to a single recessive gene (*wd*), differs from the normal form (+) by possession of the following features: erect dwarf habit, smaller leaves, thinner stems, blue-grey leaf colour, and tendency of the foliage to droop under field conditions in summer. Homozygous lines of *wd* and + were grafted in all possible combinations. In the grafts *wd*/+ and +/*wd*, the stem diameter and leaf length of the scion were shifted markedly towards the dimensions of the stock. Observations on reciprocal double-graft combinations *wd*/+/*wd* and +/*wd*/+ indicated that the effects of stocks upon scions are generated in the root system of the stocks, since the top scions showed donor characters without modification, whereas the middle scions were changed in the same manner as in the single grafts. No evidence was obtained that the immediate effects of stock upon scion were transmitted to the seed progeny.

751 MERCADO H., C.
Fase fisiológica de un ensayo sobre la teoría de la influencia somática en la transmisión de los caracteres. (**Physiological phase of an experiment on the theory of somatic influence in the transmission of characters**).
Agronomía, Lima 1952 : **17** : No. 69 : 35–39.

Grafts have been made of the tomato Gulf State on the tomato Rutgers, with the object of investigating any possible hereditary effect.

752 GOODWIN, T. W. and JAMIKORN, M.
Biosynthesis of carotenes in ripening tomatoes.
Nature, Lond. 1952 : **170** : 104–05.

Experiments by the authors have led them to conclude that the pathway of carotene synthesis postulated by Porter and Lincoln (cf. Abst. 742) for ripening tomatoes is of only minor importance, and that carotenogenesis is brought about by a "carry-over" of a biosynthetic process similar to that occurring in green leaves.

753 **Developing a new tomato.**
Res. Quart. Rev., Kingston, R.I. 1950 : **1** : 33–34.

Five promising selections have been made from the F_3 and F_4 of crosses carried out to combine early maturity with resistance to cracking; all five are of good shape, colour and flavour and have high vitamin C content. Cracking resistance will be tested for two further generations before the best selection is released.

754 HAVAS, L. J. and HEUSNER, A.
Réactions tumorales et tératologiques d'une tomate tétraploïde au *Phytomonas tumefaciens* Sm. et Twnsnd. (**Tumefaction and teratological responses of a tetraploid tomato to *Ph. tumefaciens***).
CR Acad. Sci. Paris 1951 : **232** : 1695–96.

The tetraploid strain of the tomato variety Antiboise is more resistant to tumefaction caused by *Ph. tumefaciens* than the diploid strain.

755 GALLEGLY, M. E.
Physiologic races of the tomato late blight fungus.
Phytopathology 1952 : **42** : 461–62.

At Huttonsville, W. Va., a wild cherry tomato from North Carolina, designated 36, and a few other wild introductions remained healthy for 10 days longer than the majority of tomato strains in field plots infected with *Phytophthora infestans*. These selections, possessing some form of blight resistance, were inoculated under greenhouse conditions with isolates of *Ph. infestans* from different parts of the USA. Results indicate that there are at least three races of the pathogen. All the selections proved susceptible to isolates M–13 and WV–2T which constitute one race; several selections showed some degree of resistance to M–7 and WV–6t, constituting another race, and 36 and 106 (PI 108245) were resistant to both M–7 and WV–6T as well as M–6, a third race.

756 MCCOLLOCH, L. P. and WORTHINGTON, J. T.
Low temperature as a factor in the susceptibility of mature-green tomatoes to *Alternaria* rot.
Phytopathology 1952 : **42** : 425–27.

The high degree of resistance to *A. tenuis* shown by mature-green Rutgers tomatoes under normal conditions has been broken down by exposure to 32° F for more than six days before inoculation. It is assumed that some form of injury caused by the low temperature allows the pathogen to become established.

757 KERN, H.
Über die Beziehungen zwischen dem Alkaloidgehalt verschiedener Tomatensorten und ihrer Resistenz gegen *Fusarium lycopersici*. (**The relationship between the alkaloid content of different tomato varieties and their resistance to *F. lycopersici***).
Phytopath. Z. 1952 : **19** : 351–82.

Six tomato varieties varying in resistance were infected with three strains of the fungus, of high, medium and low pathogenicity respectively. The course of infection is described. Tomatin, solanin and certain other alkaloids were found to exert a slight inhibiting effect on spore germination and mycelial development at some concentrations but a stimulating effect at others. Analysis of the tomatin content of the varieties under study showed it to be present in concentrations of 10^{-4} M., which is much too low to account for the resistance of the resistant varieties.

758 GREENLEAF, W. H.
Tests for resistance to nematodes in tomatoes.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 107.

In a survey of nematode resistance in *Lycopersicon* and *Physalis*, a high degree of resistance was found in six HES selections of tomato, *L. peruvianum* and *Physalis exocarpa*. Plants that were apparently highly resistant bore however one to several cysts which yielded living nematodes upon incubation.

759 Proeven met tomatenonderstammen resistent tegen het wortelknobbelaaltje. (**Experiments with tomato rootstocks resistant to root-knot eelworm**).
Meded. Dir. Tuinb. 1952 : **15** : 255–56.

Tomato plants of the variety Potentaat [Potentate], grafted on *Lycopersicon peruvianum* and on selected hybrids of this species with tomato, gave substantially higher yields than ungrafted plants when grown on soils infected with *Heterodera marioni*.

760 Mai, W. F.
Susceptibility of *Lycopersicon* species to the golden nematode.
Phytopathology 1952 : **42** : p. 461.

An estimation of the number of mature females per grm. of root has shown that the relative susceptibility of all species of *Lycopersicon* to *Heterodera rostochiensis* corresponds to their relative susceptibility to the root knot nematode (cf. *Plant Breeding Abstracts*, Vol. XI, Abst. 1136). Two selections of *L. peruvianum*, 47B323 and 732, possess a high degree of resistance to *H. rostochiensis*.

761 Pal, B. P., Singh, H. B. and Vishnu Swarup.
Taxonomic relationships and breeding possibilities of species of *Abelmoschus* related to okra (*A. esculentus*).
Bot. Gaz. 1952 : **113** : 455–64.

The species within the *Abelmoschus* section of *Hibiscus* are regarded as sufficiently distinct to be considered as a separate genus. Data on crossing behaviour show that *A. tuberculatus* sp. nov. is more closely related to the cultivated species, *A. esculentus*, than *A. Manihot* and *A. Manihot* var. *pungens*. *A. ficulneus* is only distantly related, crosses between this species and *A. esculentus* resulting in shrivelled or empty seeds. The F_1 hybrids were all sterile. Back crosses and crosses between the F_1 hybrids failed to produce viable seed. *A. tuberculatus* has the economically valuable characters of continuation of flowering and fruiting at a time of year when it is difficult to grow the cultivated species, and resistance to fruit borer (*Earias insulana*) and mosaic. Its borer resistance is probably wholly or partly due to its stiff hairs and thick pericarp. The F_1 hybrid of *A. esculentus* x *A. tuberculatus* cannot be used commercially, because expression of the fruit characters of *A. tuberculatus* render the fruits unsuitable for culinary purposes. The wild species equal or exceed *A. esculentus* in vitamin C content.

762 Angulo Carpio, M. D. and Orellana, E.
Aportaciones para el estudio de las variaciones cromosómicas inducidas por ultrasonidos. (**Contributions towards the study of chromosome variations induced by ultrasonic waves**).
Genet. Iber. 1951 : **3** : 3–20.

Meiotic chromosomes in *Vicia Faba* plants whose inflorescences had been treated with ultrasonic waves displayed various anomalies such as increased chiasma number, exaggerated activity of the centromere, chromosome rupture, fragmentation, translocation and agglutination, and bridge formation. The ultrasonic waves are thought to be the probable agent in producing these results, though local heating effects cannot be entirely ruled out.

763 Quastler, H., Schertiger, A. M. and Stewart, W. N.
Inhibition of plant growth by irradiation. IV. Growth arrest vs. effects on mitotic activity.
J. Cell. Comp. Physiol. 1952 : **39** : 357–69.

A dose of 5000 r. administered to 4-day-old seedlings of *Phaseolus aureus* induces immediate temporary inhibition of root tip mitoses, but although a low mitotic frequency is subsequently maintained, root growth ceases. On the other hand the mitotic inhibition caused by 170 r. is followed by resumption of mitotic activity and by normal increases in root length.

764 Lorz, A. P.
An interspecific cross involving the Lima bean *Phaseolus lunatus* L.
Science 1952 : **115** : 702–03.

Seven F_1 hybrid plants have been secured from the cross *Ph. polystachyus* x *Ph. lunatus*. All the hybrids expressed completely, or nearly completely, the hypogeal habit of germination of the female parent. Introduction of this character into the Lima bean offers a possibility of solving the problem of "neck breaking". *Ph. polystachyus* may also prove to be a valuable source of genes for resistance to diseases and pests, and useful physiological characters such as some degree of cold resistance.

765 Pruglo, V. V.
(Belosemjannaja Frunzenskaja, a valuable variety of *Phaseolus* obtained by popular selection).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 37–40. [Russian].

A new productive variety, Belosemjannaja Frunzenskaja [White-seeded Frunze], showing resistance to drought, halo blight and rust has been obtained by continuous selections of local material in the Ukraine.

766 Walters, H. J. and Starr, G. H.
Bacterial diseases of beans in Wyoming.
Bull. Wyo. Agric. Exp. Sta. 1952 : No. 319 : Pp. 12.

Mention is made of extensive trials of snap beans from many countries at Laramie and Powell to determine sources of resistance to halo blight (*Pseudomonas phaseolicola*) and bacterial wilt (*Corynebacterium flaccumfaciens*). A number of selections with a high degree of halo blight resistance, but otherwise agronomically undesirable, have been made for breeding purposes; no commercially acceptable varieties showed marked resistance to bacterial wilt.

767 Fisher, H. H.
New physiologic races of bean rust (*Uromyces phaseoli typica*).
Plant Dis. Reptr 1952 : **36** : p. 103.

Information is given on the reactions of differential varieties of beans to ten new races of rust collected in the USA during the period 1941–51.

768 Frandsen, N. O.
Untersuchungen zur Virusresistenzzüchtung bei *Phaseolus vulgaris* L. I. Phytopathologische Untersuchungen. **(Investigations on breeding for virus resistance in *Ph. vulgaris* L. I. Phytopathological investigations).**
Z. Pflanzenz. 1952 : **31** : 381–420.

A review is given of present information on the many virus diseases affecting *Ph. vulgaris*, followed by a detailed description of the two that are most important in Germany, namely bean viruses 1 and 2, including details of their symptoms, hosts, physical properties, modes of transmission, strains and relationship to each other and to other viruses. The author's own experiments showed no cross-protection effect and do not support the view that the two viruses are identical or closely related.

769 Mortensen, J. A. and Brittingham, W. H.
The inheritance of pod color in the southern pea, *Vigna sinensis*.
Proc. Amer. Soc. Hort. Sci. 1952 : **59** : 451–56.

Analyses of pod colour in the F_1, F_2 and F_3 of all possible crosses between strains with the principal pod colour groups, purple, straw, red-tipped straw and drab, have shown that pod colour is largely determined by *R*, the basic gene for colour, and the following genes of an allelomorphic series: P^p for purple pod colour; P^b, red-tipped straw; and *p*, straw. P^p produces purple pods only in the presence of *R*; when the latter is in a double recessive condition (*rr*), drab pods are produced. Similarly red-tipped straw pods are formed by P^b only in the presence of *R*; in combination with *rr* the pods are straw-coloured. A straw-coloured phenotype is also produced by *p* in the presence of either *R* or *rr*.

770 Sill, W. H. (Jun.) and Walker, J. C.
A strain of cowpea susceptible to systemic infection by various strains of common cucumber mosaic virus.
Phytopathology 1952 : **42** : p. 442.

Systemically infected individuals appearing in a population of the Black cowpea inoculated with a strain of cucumber mosaic virus which normally produces local lesions were selfed at the University of Wisconsin. Progenies were again tested with the same virus and again showed systemic symptoms but no local lesions. Inoculations with two other distinct strains of the virus produced similar results. Since the selfed plants are typical of the original population, with the exception of the above reaction, it is assumed that they have arisen by a mutation in the genes controlling response to strains of this virus.

771 Holmberg, S. A.
Odling och förädling av sojabönor i Nordamerika. **(Cultivation and breeding of soya beans in North America).**
K. LandtbrAkad. Handl., Stockh. 1952 : **91** : 116–31.

A study tour in 1951 provided the information here recorded on soya bean breeding and variety trials in Canada and the USA (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1948, Vol. XIX, Absts 1924, 2984, 2986 and Vol. XXI, Abst. 2258).

772 DIMMOCK, F.

Soybean improvement at Ottawa.

Soybean Dig. 1952 : **12** : No. 6 : 14–15.

Breeding work in progress at the Central Experimental Farm, Ottawa, is outlined, with special emphasis on the need for an early maturing, productive soya bean for eastern Ontario. Numerous promising selections have been made from progenies resulting from extensive hybridization carried out to improve oil content and disease resistance.

773 OHNISHI [ONISHI], K.

[**Studies on the ecotypes of soya bean varieties (preliminary report). On the detection of the autumn type of soya bean by cultivation at high temperatures**].

Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 319–22. [Japanese].

A series of 20 Japanese varieties were differentiated in respect of flowering date following 3 different sowing dates, the experiment being replicated in the case of the middle sowing in the field and in a greenhouse. The flowering dates of the varieties Oku and Kanagawa Kosa were not advanced by raised temperatures.

774 NAGATA, T.

[**The effect of early pinching upon the growth and yield of soya beans (preliminary report)**].

Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 323–36. [Japanese].

Varietal differences are noted in the degree of inhibited growth shown by five Japanese varieties after pinching out the terminal bud.

775 FUKUI, J. and YARIMIZU, H.

(**Varietal differences in the effect of short days after blooming on the maturation period of the soya bean**).

Ikushugaku Zasshi/Japan. J. Breeding 1951 : **1** : 86–90. [Japanese].

Three Japanese varieties were studied. All showed accelerated development under short days, but the response was greatest in the late variety Iwate 2.

776 KARASAWA, K.

Crossing experiments with *Glycine Soja* and *G. gracilis*.

Genetica 1952 : **26** : 357–58.

At the Nasu Cytogenetic Laboratory, Tochigi, Japan, fertile F_1 and F_2 hybrids were obtained between soya bean ($2n = 40$) and *G. gracilis* ($2n = 40$). F_1 plants had a twining growth habit and showed characters intermediate between those of the parents except for length of stem, which exceeded 2 m. The seed colour was a dirty yellow. In the F_2, segregation for seed colour was monogenic. The high degree of interspecific compatibility has led to the suggestion that both species may have the same genome.

777 WEISS, M. G., WEBER, C. R., WILLIAMS, L. F. and PROBST, A. H.

Correlation of agronomic characters and temperature with seed compositional characters in soybeans, as influenced by variety and time of planting.

Agron. J. 1952 : **44** : 289–97.

At Ames, Ia., Urbana, Ill., and Lafayette, Ind., the soya bean varieties Mandarin, Richland, Mukden, Dunfield and Boone were planted on five dates during three successive years. The correlations calculated between agronomic characters comprised: seed size and maturity date with oil content, protein content and iodine number; period from flowering to maturity with oil content; mean temperature during bean development with oil content and iodine number; oil content with iodine number; and protein content with oil content.

Among variety means none of these correlations varied significantly with location or year; similarly, among date of planting means there was little significant variation with location or year except for correlations between protein and oil content and between mean temperature and oil content.

Large seed size in the early varieties Mandarin and Richland was conditioned by late planting and associated with high protein content; large seed size, obtained by planting the late varieties Dunfield and Boone on the earliest possible dates, was correlated with low iodine number. Decreased length of period from flowering to maturity, resulting from late planting, was correlated with decreased oil content in Mandarin and Boone. Both Mukden and Dunfield showed a high correlation between high protein content and low oil content; in other varieties this correlation was not significant.

778 **Dorman developed with eye on Dixie.**

Sth. Seedsman 1952 : **15** : No. 8 : 23, 62.

Dorman soya bean, selected at the Mississippi Agricultural Experiment Station from the F_2 of the cross Dunfield x Arksoy 2913 made at the US Regional Soybean Laboratory, Urbana, Ill., has been released to replace S–100 over a wide area, including the Mississippi valley, and other midsouthern states. The oil content of Dorman is 2·5–3% higher than S–100; its seed yields have exceeded those of S–100 and equalled Ogden, a variety which matures 14–18 days earlier than Dorman.

779 Nagata, T.
(On varietal differences in alteration of stem height due to different sowing dates in soya beans).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1951 : **19** : 279–82. [Japanese].

By sowing soya bean varieties in April, May and June, they could be differentiated into three types in respect of the relative height of stem attained after each sowing date. In type I, stem growth was greatest after the April sowing, intermediate after the May sowing, and least after the June sowing; in type II, the order was May>April>June; while in type III, the order was May>June>April. Some correlation between these types and provenance was noted.

780 Gordienko, V. A.
(A new soya bean variety in Moldavia).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 40–42. [Russian].

Beljckaja 636 was selected at the Moldavian State Breeding Station from Dobrudžanka [Dobruja]. It is a mid-season variety showing resistance to drought, and more productive and with a higher 1000 seed weight than Dodrudžanka. Its seed has a higher fat content than that of the initial form, but its protein content is lower. The pods of Beljckaja grow 10–12 cm. above the ground.

781 Klykov, A. P.
(Heritable changes in soya bean when grown under cold temperatures).
Agrobiologija (Agrobiology) 1952 : No. 4 : 70–75. [Russian].

At the USSR Scientific Research Institute for Soya Beans and Castor Oil Plants, VNIIMK* 9186, Kubanskaja 4958 and 276 [Kubanj 4958 and 276], Harbinskaja 231–a [Harbin 231–a] and Novokubanskaja 52 and 6–22–2 [New Kubanj 52 and 6–22–2] gave many new forms when selected for hard seed and sown earlier or later than the normal sowing time. Over 40 new forms have shown promising economic characters. The development of new types was most extensive when the material was selected for the hard seed character for two years in succession and when it was sown at a very early date.
Hard seed was found to be associated with resistance to disease, productiveness, high protein content of the bean and extensive development of mycorhizal roots.

782 Cartter, J. L., Osler, R. D., Lawrence, R. E. and Younger, C. J. (Compilers).
Results of the cooperative uniform soybean tests. Part I. North Central States.
US Dep. Agric., Agric. Res. Admin., Bur. Pl. Indust., Soils, Agric. Engin., Div. Forage Crops Dis., US Reg. Soybean Lab. Urbana, Ill. 1952 : Pp. 90. (Mimeographed).

Hartwig, E. E. and Bounds, E. (Compilers).
Results of the cooperative uniform soybean tests. Part II. Southern States.
Ibid. 1952 : Pp. 104. (Mimeographed).

Data are presented on the performance of soya bean varieties and strains in regional trials in the USA.

783 Humphrey, L. M.
Soybean variety test.
Soybean Dig. 1952 : **12** : No. 6 : 25–26.

Results of trials conducted at the Dortch Seed Farms, Scott, Ark., during 1952 are presented. An experimental strain from the breeding nursery, provisionally designated Dortchsoy 2A, outyielded all other strains and commercial varieties of midseason maturity; it will not, however, be released until 1954. Among the early maturing types, a new variety of hybrid origin gave highest yields; it has been released to growers as Dortchsoy 67. Two earlier strains still in the experimental stage have shown promise.

784 Šuljga, P. M.
(Intergeneric hybridization of the pea).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 5 : 24–26. [Russian].

Breeding peas for resistance to lodging at the Uladovo-Ljulinec Breeding Research Station includes vegetative hybridization. The material comprised grafts of the pea varieties Uladovskiĭ 208 [Uladovo 208] and Uladovskiĭ 387 and some promising new pea hybrids on the broad bean varieties Fioletovyĭ [Mauve] and Buryĭ [Brown]. F_2 hybrid 3192 was also grafted on Uladovskiĭ 208 and 387. Changes in the colour, shape and size of the seed occurred in the V_0 generations of some pea/broad bean grafts. The most remarkable of these were observed in graft hybrids 129 and 141, from Uladovskiĭ 208 and Uladovskiĭ 387 on Fioletovyĭ respectively, which showed appreciable increases in 1000 seed weight.

---

* Vsesojuznyĭ Naučno-Issledovateljskiĭ Institut Masličnyh Kuljtur [USSR Scientific Research Institute of Oil Plants].

785 Zaĭceva, A. A.
(Cross pollination of leguminous plants grown for seed).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1952 : No. 6 : 55–57. [Russian].

At the Karaganda Agricultural Research Station a new variety of pea, Zelenozernyĭ Dolinskiĭ [Green-seeded Dolinskiĭ] showing resistance to late frost and drought has been obtained by selection and intravarietal cross pollination of a local strain of Folger Heine; another promising productive green-seeded form has been selected from Viktoria Strube.

A tall variety of chickpea with white seed has been produced by hybridization involving several white-seeded varieties and a tall red-seeded variety.

Vegetative rapprochement did not improve crossability between pea and *Cicer*, as peas grafted on *Cicer* produce normal pea seed when pollinated with mixed pollen of *Pisum* and *Cicer*, and gave seedless parthenocarpic fruits when pollinated with *Cicer* alone. However, some hybrid seed was obtained when the new *Cicer* hybrid was grown in the same field as a green-seeded hybrid pea. The seed produced an F_1 and F_2 with green seed. The cookability of the new form is being tested.

786 Cruickshank, I. A. M.
Pea-wilt in New Zealand.
N.Z. J. Sci. Tech. 1951 : **33** : No. 4 : 75–80.

This study of *Fusarium orthoceras* var. *Pisi* includes information on the reaction of pea varieties. Of the 24 tested, 9 garden and 4 field varieties exhibited resistance.

787 Inkilä, O.
Hernekääriäisen (*Grapholitha nigricana* Steph.) peltoherneelle aiheuttamista vahingoista. (**Damage caused to field peas by *Grapholitha nigricana* Steph.**).
Maataloust. Aikakausk. 1948 : **20** : 58–66.

Experimental data concerning several Finnish and foreign varieties of pea are given to show the degree of damage caused over a period of four years by *G. nigricana*. There appears to be some positive correlation between the degree of damage and both the earliness of the commencement of flowering and the overall length of the flowering period although no decisive conclusion is reached. No correlation was found between degree of damage and the period of vegetative growth.

788 Swenson, S. P. and Miravalle, R. J.
Ninth annual report of pea improvement work 1951 of the Department of Agronomy Washington Agricultural Experiment Station : Pp. 10.

Tabulated data are presented concerning the performance of numerous commercial varieties and strains, and selections from F_2–F_8 hybrid progenies of 34 crosses. Highest yields were given by Idaho White and First and Best 1. Among the new hybrid selections on trial the following appear promising: 48–573, 49–1591, 50–370, 50–369 and 50–376, all from Alaska x Idaho White; 50–309 (SCL 5–43 x White Sugar); and 49–1537 and 50–330 from Alaska x Kaiser. Selection 50–309 is the first high yielding variety produced with a membraneless pod, a character which reduces shattering in field peas.

Some 50 introductions supplied by the US Department of Agriculture were grown for observations on flowering times and seed characters.

The degree of natural crossing occurring in plots of yellow-seeded First and Best and green-seeded Alaska was 0·54%; cross pollination was slightly more frequent between adjacent plots than between plots 10 ft. apart. Although the percentage of natural crossing is relatively low it is sufficient to be of importance to breeders and seed producers. Since wind may be responsible for much of the cross pollination observed, distances greater than 40 ft. should separate plots aligned in the direction of the prevailing wind.

789 Balasubrahmanyan, R.
Mutation in gram (*Cicer arietinum*).
Indian J. Agric. Sci. 1951 : **21** : 109–12.

Descriptions are given of 13 mutants which arose spontaneously in 10 strains from Pusa and 2 local strains grown at Coimbatore. Eight genes, C, B, P, S, T^2, T^1, F^r and R, determining petal colour, seed colour and seed surface, were shown to be responsible for the mutant types, each type having a maximum of two mutant genes. C, B and P tended to mutate most frequently. Two distinct strains from Pusa, T 69 and T 81, gave rise to individuals of the same genotype, viz:—$CBPST^2T^1F^{\mathrm{r}}R$; these mutants were phenotypically indistinguishable and showed gigas characteristics compared with their respective parents. The somatic chromosome number was, however, found to be 16 in both parents and mutants. Similarly, the local strains Co. 426 and Co. 498 both produced individuals which were alike in all respects, having the genotype $CbPSt^2t^1f^{\mathrm{r}}r$.

It has been suggested that mutations may have arisen in the Pusa strains as a result of temperature changes associated with the change of environment. Mutations from recessive to dominant genes were common in the strains from Pusa, whereas mutations to the recessive condition occurred among local strains.

790 ARGIKAR, G. P.
Occurrence and inheritance of "filicoid" form in *Cicer arietinum* L.
Curr. Sci. 1952 : **21** : p. 76.

Plants with an alternate arrangement of the leaflets and plants possessing a filicoid habit segregated in a 3 : 1 ratio in the F_3 of a cross between var. *alternifolia* and a normal individual, and in some F_4 progenies derived from F_3 segregates of the *alternifolia* type. On the basis of the sterility of the filicoid plants, it is suggested that this mutant type may be the result of chromosomal abnormality.

791 BALASUBRAHMANYAN, R.
Inheritance of seed coat colour in gram (*Cicer arietinum*).
Indian J. Agric. Sci. 1951 (1952) : **21** : 239–43.

Two large-seeded Italian strains designated Bari I and Bari II, having dark brown and black seeds respectively, were successfully crossed with Co. 468 and T 13 at the Nanjanad Research Station, 6000 ft. above sea level, after attempts had failed at Coimbatore. Analyses of hybrid progenies, which grew well under conditions at Coimbatore, have revealed two new factors, T^3 and T^4, affecting seed colour. T^4 produces black seed, irrespective of the presence or absence of P, controlling petal colour and shape and size of the seed; on the other hand, t^3 produces dark brown seed only in combination with P. The genotypes pT^3 and pt^3 are expressed phenotypically by buff-coloured seeds.

792 ABDUL HAFIZ.
Basis of resistance in gram to *Mycosphaerella* blight.
Phytopathology 1952 : **42** : 422–24.

At the Punjab Agricultural College, Lyallpur, Pakistan, the reactions of (*a*) two blight resistant strains of *Cicer arietinum* supplied by the US Department of Agriculture as Nos. 4732 and 281, but renumbered F 8 and F 10 respectively, and (*b*) two local strains, P 7 and P 15, susceptible to *M. Rabiei*, have been correlated with degree of hairiness of stems and leaves. The large numbers of hairs possessed by resistant varieties secrete sufficient malic acid to delay or inhibit the germination of fungal spores; moreover, any hyphae which germinate in such an environment penetrate the epidermal tissues of F 8 and F 10 with difficulty.

In the seedling stage, before hairs are developed, all gram varieties are equally susceptible, but under field conditions the spores of the pathogen are liberated only when gram plants are fully grown.

793 PATHAK, G. N. and YADAVA, R. S.
Spontaneously-originated hexaploid and tetraploid plants in *Cajanus cajan* Mill sp.
Curr. Sci. 1951 : **20** : p. 304.

Naturally occurring tetraploids ($n = 22$) and hexaploids ($n = 33$) have been observed at the Kanpur Agricultural College, India. The hexaploids set no seed. Out of the 9 tetraploids, five produced some seed. It is suggested that chromosome doubling may have occurred in diploids and some natural triploids, possibly as the result of cold conditions during a hail storm.

794 ANDREW, R. H.
Duration of silk receptiveness in sweet corn inbreds.
Agron. J. 1952 : **44** : 387–88.

Under optimum conditions for pollination, stigmas of four sweet corn inbreds were most receptive to pollen up to 8 days after emergence; between 8 and 14 days the seed set of 74–86% fell to 5% and subsequently remained level, at between 5% and 1%, to the end of a 27-day period.

795 **Improved corn "off the cob".**
Sth. Seedsman 1952 : **15** : No. 9 : p. 68.

A strain of sweet corn with fully developed glumes necessary for pollen protection on the male inflorescence, but very short glumes on the female flowers, has been developed at the University of Wisconsin. Crosses are in progress to combine the glumeless character, which facilitates removal of the kernels from the cob, with other desirable qualities of commercial sweet corn hybrids.

796 Woodroof, J. G., Shelor, E. and Bailey, J. E.
Varieties of sweet corn for freezing.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : p. 113.

The results of tests on the suitability of 22 sweet corn varieties for processing and freezing, carried out at the Georgia Agricultural Experiment Station, are briefly surveyed.

797 Yarnell, S. H.
Breeding for resistance to the earworm in sweet corn.
Proc. Ass. Sth. Agric. Wkrs 1952 : **49** : 106–07.

Breeding at the US Vegetable Breeding Laboratory, Charleston, SC, is outlined. Dominant, recessive, complementary and cumulative factors appear to be involved in the inheritance of resistance to earworm. Experimental inbreds selected for resistance and their hybrids possess much more resistance than current commercial varieties. No correlation has been recorded between ratings for resistance and percentage of ears with a husk extension of 2 inches or more beyond the apex. The rating of an inbred for resistance is not necessarily an indication of its rating in combination with a tester.

798 Nelson, R.
Mint rust and its control.
Quart. Bull. Mich. Agric. Exp. Sta. 1952 : **34** : 436–55.

Records made since 1944 concerning the reaction of species and interspecific hybrids of *Mentha* to races of *Puccinia Menthae* indicate that the specific relationship between rust and host reported by Baxter (cf. *Plant Breeding Abstracts*, Vol. XXII, Abst. 2358) does not exist in Michigan. In nurseries at Mentha and East Lansing during 1951, the host range was extended so that many hybrids from *M. piperita* x *M. crispa*, not previously susceptible, became lightly rusted; clones of *M. spicata*, also previously rust resistant, showed similar light infection during 1951. This suggests that both hosts are genetically similar with respect to factors controlling rust reaction. There is evidence that rust resistance in *Mentha* is conditioned by a single dominant factor.
Breeding in progress at East Lansing to combine good oil quality with resistance to rust and wilt in varieties of peppermint and spearmint is reviewed.

799 Adatia, R. D. and Shah, G. L.
A contribution to the life-history of *Coriandrum sativum* Linn.
J. Univ. Bombay 1952 : **20** : Sect. B : Pt. 5 : 34–46.

A study of the flower development and embryology of *C. sativum* is reported. The chromosome number was usually found to be $n = 11$; a strain with $n = 12$ may also exist.

BOOK REVIEWS

Radhakrishna Rao, C.
Advanced statistical methods in biometric research.
John Wiley & Sons, Inc., New York and Chapman & Hall, Ltd., London 1952 : 60s. : Pp. xvii + 390 : figs. : tables.

The author is a well-known mathematical statistician who has had experience in applying the methods of multivariate analysis in the biometric field, chiefly in racial discrimination problems in physical anthropology. The book is definitely not easy reading for the non-mathematician, and is not a beginners' treatise for the mathematician. But it covers the groundwork of the subject by a preliminary chapter on the algebra of vectors and matrices, and by chapters on the theory of distributions, the theory of linear estimation and tests of hypotheses, the general theory of estimation and the method of maximum likelihood, large sample tests of hypotheses, with applications to problems of estimation, and tests of homogeneity of variances and correlations. We come in Chapter 7 to a good account of tests of significance in multivariate analysis, while the book closes with a study of statistical inference applied to classificatory problems, and of the concept of distance and the problem of group constellations. In the latter part of the book the author is dealing with his own researches, but it is an advantage to the reader that difficult multidimensional mathematical problems are written round actual data, which are worked through in illustration of the methods. J. W.

Quenouille, M. H.
Associated measurements.
Butterworths Scientific Publications, London and Academic Press Inc., New York 1952 : 35s. : Pp. x + 242 : 35 figs. : tables.

The content of this book is not very clear from the title, but one does not have to dip very far into it to see that it concerns itself with the methods, mainly statistical in character, that are needed in deriving various measures of association between both quantitative and qualitative variables in the experimental sciences. There are four sections. The first performs a useful function by describing various graphical methods of investigation, estimation and testing, in which the numerical calculations are kept down to the minimum. The second section is concerned with the routine numerical analysis of data, estimating and testing regression and correlation coefficients, and going as far as multiple and curvilinear association. In the third section a number of newer adaptations and developments of the routine methods are outlined. In particular, chapters are given up to the analysis of covariance and to the planning of the analysis for large-scale investigations. The final section concerns itself with newer and consequently less familiar methods. Probit analysis is one of these; another is time series analysis, while the last chapter, which is heavy-going, is an attempt to summarize the various methods and tests which are generally grouped under the heading "multivariate analysis". A bibliography is given for further reading, and the necessary statistical tables are provided in an appendix.

J. W.

GOLDSCHMIDT, R. B.
Understanding heredity.
Chapman & Hall, Ltd., London and John Wiley & Sons, Inc., New York 1952 : 30s. : Pp. ix + 228 : 49 figs.

It is a significant reflection of the times we live in that an elementary book on heredity can no longer limit itself to a clear exposition of genetical principles but must at almost every stage of the argument add assurances to the reader, to the effect that "this is the genuine truth and I can produce witnesses to prove it if you don't believe me." These assurances have, since the wide diffusion among the general public of a knowledge of the views of the Soviet school of geneticists, headed by Lysenko, unfortunately become necessary. They make the text however somewhat laboured and in many cases less clear than a more straightfoward but less guarded presentation; the same reasons obviously account for a certain aggressive quality of the statement of certain principles: "genes do occupy definite positions on the chromosomes", we read; and "*in no such test has an inheritable effect of the environment ever been observed*"; or again: "have the original chromosomes actually survived all these resting and dividing periods? I can confidently answer: They have". Some more sophisticated readers may be led to wonder whether the author, like the lady in the play, doth not "protest too much". Notwithstanding this general reservation, the book can be recommended as one of the most accurate presentations of the basic principles of heredity available at the present time. It makes use of many of the classical examples as illustrations but the interest will be heightened for the general reader by the use of frequent instances from man, as in the explanation of multiple alleles by reference to blood groups. A final chapter gives the beginner a very brief glimpse into some more recent problems of genetics such as mutation studies and their significance in understanding the nature of the gene and of evolution, salivary gland chromosomes, sex inheritance, the genetics of microorganisms and biochemical genetics.
The student is provided also with a set of problems relating to each chapter, a graded bibliography and a glossary.

GARDNER, E. J.
Genetics laboratory manual.
Burgess Publishing Company, Minneapolis, USA 1952 : $1·50 : Pp. vi + 53 : figs. : tables.

This laboratory manual, comprising instruction sheets printed on one side only and held together by paper clips, presents a series of simple exercises devised to supplement the lecture course in elementary genetics given at Utah State Agricultural College, USA. Well-known methods are used to demonstrate many basic principles, including: the laws of probability, which are illustrated by tossing coins; the expression of dominant and recessive characters in Mendelian ratios, using progenies of crosses between peas with round yellow and wrinkled green seeds; the influence of gene interaction and linkage on aleurone colour of maize kernels; sex linkage in *Drosophila*; and balanced lethals in barley. Numerous theoretical exercises are also suggested in addition to practical observations. Laboratory work of this nature obviously helps to give students experience in scientific method and clarifies the principles and problems of genetics. It should however be emphasized that although the introduction mentions with regret the number of genetics students who have read and heard much about chromosomes but never seen one, this particular course still omits to provide the opportunity.

STUBBE, H.
Über einige theoretische und praktische Fragen der Mutations-forschung. (**Some theoretical and practical questions in the study of mutations**).
Akademie-Verlag, Berlin 1952 : DM 4·50 : Pp. 23 : 17 tables : plates.

This attractively presented volume reproduces the lecture given by Dr Stubbe to the German Academy of Sciences on 14 Jan. 1952. The speaker firstly discussed certain evolutionary questions which his studies of induced mutations have helped to elucidate. Flowers of the *transcendens* mutant in *Antirrhinum majus* are in form almost identical with those of many other genera of the Antirrhinoideae. The *hemiradialis* mutant with five stamens and radial flowers resembles the neighbouring genus *Verbascum*. When the mutants first appear, their progeny is usually variable in respect of the character in question, and the forms appearing in nature seem to owe their stability to the effect of further mutations, either in other loci or in the same allelic series. The expression of the characters in the mutants is strongly affected by environmental factors, the *transcendens* forms having a much larger number of two-anthered flowers when grown outside than when grown in the greenhouse or on highly fertile soil. It has not been possible to change the proportions by selection. However, when *transcendens*$_2$, which normally has 60% of flowers with two anthers, was crossed with wild forms, the F_2 contained a relatively small number of two-anthered flowers but the proportion of them rose in the F_3, and in the F_4 it reached 90·9%; a number of flowers with one anther also occurred in the F_3 and later generations. By selection for two and one-anthered flowers in these crosses the proportion was raised to 94·6% and 91·1% respectively in the F_4. The effect of selection in these hybrid progenies has evidently resulted from the stabilization of genes in other loci. Similar results were obtained with the *neohemiradialis* mutant with increased anther number; selection in the original mutant line had little or no effect, whereas by selection in crosses with certain wild forms the proportion of flowers with five or six anthers was raised to 99·3% or more. Thus the fixation of a new evolutionary character depends on changes in both the main genes and the modifiers.

In experiments on artificial mutations in barley, the author has obtained certain forms displaying superiority in such features as earliness, standing capacity, yield and disease resistance; these include a mutant of Friedrichswerther Berg 8 winter barley which is resistant to mildew races A and D, but in other respects is not inferior to the original strain; also naked mutants of some of the best barley varieties, others with up to 20% protein in the grain, and others again with as little as 9%.

Promising tomato mutants have also been produced, including bush forms, and early maturing mutants which are equal or superior to the parent varieties in yield.

The barley and tomato mutants are illustrated in a series of excellent illustrations.

Symposia of the Society for Experimental Biology. Number VI. Structural aspects of cell physiology.
Cambridge University Press 1952 : 45s. : Pp. vii + 357 : figs. : tables : plates.

This admirable volume embodies the papers presented at the Symposium of the Society for Experimental Biology held in Bristol in July 1951. It covers a wide range of topics related to developments in studying the mode of action and structure of living cells, many of them made possible by new methods such as improved polarized light and ultraviolet techniques, the phase contrast and electron microscope, and the use of radioactive isotopes. Collected together between the covers of a handsome book, the material presented makes an imposing example of recent advances in our knowledge of the vital processes at work in the cell, and has been made possible by the cooperation of the Rockefeller Foundation, Imperial Chemical Industries Ltd., and the British Council. Apart from a number of inaccuracies in the citations of foreign works in the bibliographies, and certain unconventional spellings such as homogenous on pp. 65 and 74, dependant on p. 158 and *Vicia faber* on p. 235, the presentation is accurate and attractive, and the range of ground covered can be seen from the following, of necessity exceedingly condensed, review of the contents:—

Danielli, J. F. Structural factors in cell permeability and secretion. (pp. 1–15).

The development of ideas on the nature of cell permeability is traced in the three main periods 1890–1930, 1930–40 and 1940 to the present date. Evidence emerging from the work of the author and his colleagues is presented to show that alkaline phosphatase is associated with secretory activity, being possibly involved in some contractile protein mechanism.

Katz, B. The properties of the nerve membrane and its relation to the conduction of impulses. (*pp. 16–38*).

Evidence is presented to show that potassium and chloride ions can penetrate the surface layer more readily than sodium ions and organic anions, thus enabling an electric potential to be built up. The rate at which diffusion takes place suggests that the surface is a membrane of extremely low ionic permeability, probably composed mainly of insulating lipoid material. The selective permeability, and thus the potential, are reversed during excitation of the membrane.

Runnström, J. The cell surface in relation to fertilization. (*pp. 39–88*).

The significance of the surface layers is discussed with particular reference to the jelly-coat substance of the sea-urchin egg. The species specificity of the jelly is greater than that of the vitelline membrane, which in turn is greater than that of the cytoplasmic surface. The various changes that occur in the surface after fertilization seem to point to a loosening of the submicroscopic fibrous elements of the cytoplasm, apparently resulting from the breakup of the carbohydrates that cement them.

Swann, M. M. The nucleus in fertilization, mitosis and cell-division. (*pp. 89–104*).

An attempt is made to relate the two processes of mitosis and cleavage in terms of the physical changes occurring in the protoplasmic structure. Analysis of the birefringence changes in the cytoplasm of sea-urchin eggs from metaphase to cleavage shows that certain structural changes are brought about by the chromosomes, probably by the release of catalytic substances, for which the name "structural agents" is suggested. There is evidence that the cortical changes at cleavage are brought about in the same way, and that the changes at fertilization are caused by the release of structural agents from the head of the fertilizing spermatozoon. Chromosomes, cytoplasmic viscosity, cytoplasmic refractive index, respiration, quantity of -SH groups, cortical viscosity, cortical tension and type of plasmolysis all show evidence of undergoing cycles which reverse at metaphase and interphase. Certain cycles of change may be suppressed by particular treatments such as colchicine, while others still continue.

Mitchison, J. M. Cell membranes and cell division. (*pp. 105–27*).

The cell membrane of animal cells is viewed as consisting of a permeability layer of lipids above a structural layer of looped protein, the latter being responsible for the birefringent properties of the membrane, which shows positive form, and negative intrinsic, birefringence. When the looped proteins become disorientated the membrane expands in area. This seems to occur at the time of cleavage, when a wave of expansion, thought to be caused by the diffusion of some substance from the chromosomes, spreads from the polar regions of the egg towards the equator. This expansion is accompanied by an increased permeability, a reduced negative birefringence and tension of the membrane and a reduction of the internal pressure to zero. The process still continues if the asters are destroyed by colchicine or a microneedle.

Goldacre, R. J. The action of general anaesthetics on amoebae and the mechanism of the response to touch. (*pp. 128–44*).

The membrane increased about three times in area when cells were anesthetized, the result being that the membrane lifted away from the cytoplasm, except at the tail in amoebae and at the furrow in dividing cells; the hyaline layer between membrane and cytoplasm increased greatly in thickness, at the expense of the cytoplasm, which contracted. Cells that had just divided were more sensitive than older cells.

Kitching, J. A. Contractile vacuoles. (*pp. 145–65*).

Various mechanisms by which the contractile vacuoles in amoebae and other invertebrates may be supposed to function are discussed. In his own words the author pictures "the osmiophile cytoplasm as secreting minute contributory vacuoles by a process which may not be purely osmotic. The water in these minute vacuoles probably contains or comes to certain various crystalloids in solution. If there are excretory substances, produced within the cells, which cannot diffuse out through the cell surface, these may well be removed by the action of the contractile vacuole".

Coons, A. H. The cellular fate of injected antigens. (*pp. 166–72*).

By injection of fluorescein-labelled antibody solutions it was possible to stain antigens and thus trace what happens to them after injection into mammalian tissue. Protein antigens penetrated into the nuclei of all the cell types into which they entered.

Brachet, J. The role of the nucleus and the cytoplasm in synthesis and morphogenesis. (pp. 173–200).

A gradient of ribonucleoprotein granules, the properties of which in many respects resemble those of viruses, has been demonstrated in the fertilized egg and seems to be responsible for its first histological differentiation. Until the 4-blastomere stage the amount of desoxyribonucleic acid seems to be the same in all the nuclei; after this stage marked differences set in. Synthesis of ribonucleic acid does not begin until gastrulation, when the nucleoli make their appearance; the incorporation of radioactive isotopes in the proteins is intensified also at this stage, and new proteins appear. The synthesis of cytoplasmic ribonucleoprotein is depressed in lethal interspecific hybrids, there being an accumulation of ribonucleic acid in nucleoli and this apparently inhibits mitosis. Evidence is presented which suggests that the ribonucleoprotein granules are capable of self-duplication and of passing from cell to cell and that they play an active part in protein synthesis; their synthesis or multiplication, in turn, seems to be under the control of the nucleus though the control is indirect and is envisaged in some such form as the production of coenzymes such as those which establish a coupling between oxidation and phosphorylation.

Sanders, F. K. The behaviour of viruses within cells. (pp. 201–17).

The course of infection and multiplication within the cell is traced in the four main types of virus. It is pointed out that the detailed studies of purified viruses so far made have been concerned with viruses in the relatively static form reached at the end of multiplication. These particles, on entering the cell, apparently break down into smaller units, which then seem to act as directive centres for the production both of replicas of themselves and of other inert constituents. The way in which this self multiplication is brought about remains unknown and analogies which have been made between completed virus particles and genetic entities may be misleading.

Pontecorvo, G. Genetical analysis of cell organization. (pp. 218–29).

Evidence is cited which shows that the several genes required to produce compounds such as biotin and p-aminobenzoic acid are closely linked and must be present not only in the same nucleus but in the same chromosome of *Aspergillus nidulans* in order to exert their effect. Certain mutant strains requiring exogenous l-lysine are competitively inhibited by l-arginine, others requiring l-arginine are inhibited by l-lysine; heterozygous diploids with the two genes in either *cis* or *trans* combinations within a nucleus are non-requirers and are unaffected by the exogenous inhibitors, whereas hetercaryons with the genes in different nuclei in a common cytoplasm are highly sensitive and moreover exhibit a peculiar form of growth in spurts, possibly conditioned by "a see-saw equilibrium, one nucleus mediating the synthesis of a metabolite which inhibits the activity of that nucleus but is required by the other nucleus, and vice versa".

Baltzer, F. The behaviour of nuclei and cytoplasm in amphibian interspecific crosses. (pp. 230–42).

The results discussed indicate that lethality is usually only partial and some grafts of hybrid tissue into normal hosts have been successful. No conclusive interpretation of the hybrid derangement in terms of RNA and DNA can yet be made.

Callan, H. G. A general account of experimental work on amphibian oocyte nuclei. (pp. 243–55).

Descriptions are given of the properties of the nuclear membrane, the nuclear sap, the nucleoli and the chromosomes as seen in the giant nuclei of amphibian oocytes. The view is held that the nuclear sap is a complex protein and does not contain nucleic acid, that DNA is confined to the chromosomes and that the nucleoli contain proteins of high molecular weight and give positive reactions for phosphorus, alkaline and acid phosphatase and ribonucleic acid.

Hughes, A. Inhibitors and mitotic physiology. (pp. 256–64).

It has now been demonstrated that natural cell components such as nucleic acids and their constituents can act as mitotic inhibitors, which suggests that many substances may exert their effects indirectly by displacing nucleic acids rather than directly. It further suggests that the role of the chromosomes may be to act as depositories of these inhibitory substances which when freely distributed keep the cell in interphase.

Walker, P. M. B. and Yates, H. B. Ultra-violet absorption of living cell nuclei during growth and division. (pp. 265–76).

The observations indicate that there are substances other than DNA in the cell which absorb ultraviolet light; differences have been observed in absorption rate from cell to cell and these may be related to synthetic changes occurring during interphase.

Size differences not associated with differences of ploidy were observed from cell to cell.

Lindegren, C. C. The structure of the yeast cell. (pp. 277–89).

A full description is given of the various structures which comprise the yeast cell, in the resting and the dividing stages. Pedigrees in which irregular ratios occur are being examined for polyploidy by the ultraviolet test. The author now envisages the gene as a series of identical sites around the periphery of the chromosome, at which the agents responsible for the action of the gene are located. Since these sites are very numerous, any longitudinal splitting of the chromosome necessarily gives rise to two qualitatively equivalent parts. Many of the organelles which make up the cell, such as the cell wall, the plasma membrane, the nuclear membrane, the centrosome, the centrochromatin and the cytoplasm have the same continuity that characterizes the chromosomes and cannot arise *de novo*. They all appear to reproduce by the simple accretion of molecules. The only essential feature which distinguishes the chromosome from the other organelles is its linear heterogeneity, which leads to the impression that it is more mutable. Changes may occur in the extrachromosomal apparatus, involving differentiation or dauermodification, but these are always restored on crossing.

Chayen, J. The structure of root meristem cells of Vicia faba. *(pp. 290–305).*

The area in section of nuclei fixed at the period of highest mitotic activity is greater than at other times. Both the clear middle zone and the nucleolar core were visible in the nuclei of living staminal hairs of *Tradescantia* and the middle zone was seen to be enlarged in root cells in proximity to cells in process of mitosis. It is shown that other substances present in the cell besides nucleic acid are responsible for absorption at 2650 Å.

Manton, I. The fine structure of plant cilia. (pp. 306–19).

New information concerning the detailed structure of cilia has been obtained by ultraviolet and electron microscope studies of cells from a wide range of plants, and points to phyletic affinity between the brown algae and some of the fresh-water algae and aquatic fungi. The fact that the cilia of almost all the organisms studied show fibrillar disintegration into eleven strands may be of significance in relation to the problem of chromosome structure.

Frey-Wyssling, A. Growth of plant cell walls. (pp. 320–28).

Polarizing and electron microscope observations of maize coleoptiles have shown that the growing cell wall is living, and grows by the synthesis of microfibrils *in situ* by the cytoplasm. The cytoplasm remains exposed at the tip and exterior forces such as turgor pressure do not contribute directly to cell elongation.

Brown, R., Reith, W. S. and Robinson, E. The mechanism of plant cell growth. (pp. 329–47).

The effects of various elements such as potassium and oxygen, and of sugars, suggest that growth is regulated by the supply of certain enzyme complexes and by an arresting mechanism which gradually brings it to a close.

Preston, R. D. Biological units of cellulose structure. (pp. 348–57).

Examination of lamellae of the wall of *Valonia* under the electron microscope shows the microfibrils to be flat and to lie on their broad faces; they lie very close together and are cemented together by noncrystalline material. In the innermost lamella in most intimate contact with the cytoplasm they are arranged at random and seem to originate not in the entire cytoplasm but in certain localized regions of it.

HEWITT, E. J.
Sand and water culture methods used in the study of plant nutrition.
Commonwealth Agricultural Bureaux, Farnham Royal 1952 : Tech. Comm. No. 22 of the Commonwealth Bureau of Horticulture and Plantation Crops, East Malling 1952 : 42s. or $6·25 : Pp. x + 241 : 8 figs. : 23 tables : plates.

This comprehensive survey of methods devised for the study of the growth and mineral nutrition of plants in controlled cultures will be widely welcomed by all those interested in the scientific and practical aspects of the subject. Part I reviews and assesses the sand and water culture methods employed by the numerous investigators, very detailed information being given on plant containers, the grading, analysis and properties of sands, water supply, nutrient composition and supply, aeration, biological factors and other matters. The survey is restricted to research, hydroponic methods mainly concerned with horticultural application being omitted unless relevant to the aims of the survey. Special attention is given to methods for the study of problems of trace contamination and micronutrient deficiency, topics with which the author is especially well qualified to deal, by reason of his own important investigations at the Long Ashton Horticultural Research Station, Bristol, England. In part II, a full account is given of the technique for large scale pot sand cultures, which has been developed at the Long Ashton Station, and which is applicable to the study of the nutrition of a diverse range of agricultural and horticultural crop plants. Sir Edward Salisbury contributes a foreword to this valuable, authoritative review.

BARTON-WRIGHT, E. C.
The microbiological assay of the vitamin B-complex and amino acids.
Sir Isaac Pitman & Sons, Ltd., London 1952 : 18s. : Pp. x + 179 : 30 tables : 25 figs.

Now that breeding for high yield is tending to show signs of the operation of the law of diminishing returns, plant breeders have begun to pay increasing attention to the biochemical constitution of their products, in particular to the content of major nutrients and vitamins. This interest requires the development of sensitive analytical methods for determining the concentrations of these substances, many of which are extremely difficult to assess quantitatively by standard chemical procedures. It is in this connexion that microbiological assay techniques have become of special value since they provide a means of estimating the plant constituents of major dietetic interest.

In his outline of these techniques, Dr Barton-Wright gives details for the estimation of riboflavin, nicotinic acid and its amide, pantothenic acid, biotin, thiamin, folic acid, the vitamin B_6 complex, inositol, choline, p-aminobenzoic acid and the principal aminoacids. For each substance, information is provided on the test organism, frequently an X ray or ultraviolet ray mutant, the basal medium, the preparation of the inoculum, the preparation of the sample for assay, the method of determining the growth response of the test organism, and the method of calculating the results, including appropriate scale transformations. Since the success of microbiological assay depends almost entirely on careful attention to technical details, the information given in this work should prove of great value to all research workers concerned with the nutritive value of plant products.

PRESTON, R. D.
The molecular architecture of plant cell walls.
Chapman & Hall, Ltd., London 1952 : 36s. : Pp. xii + 211 : 9 plates : 67 figs. : 16 tables.

"The present book", as Dr Preston explains in his preface, "is written . . . chiefly for botanists. At the same time, it is hoped that it may prove of interest also to physical scientists and . . . to fibre technologists". The first chapters are devoted to a brief historical introduction, and a discussion of the form of the plant cell. There follows a description of the more important physical and chemical methods used in the investigation of cell wall structure. Finally comes an account of the experimental work leading to our present knowledge of the architecture of plant cell walls, a field of research in which Dr. Preston and his colleagues have for many years been actively engaged.

The volume is printed in clear type and excellently illustrated by a wealth of plates and diagrams. The text appears to be remarkably free from error, those few misprints hitherto detected being trivial and not likely to lead to misapprehension. The carbohydrate "cellotetrahose" (p. 79) is probably a Cornish variant. And the intention on p. 81, in the sentence "the group method yields a number (of) average molecular weight", is clear enough. There are however a number of statements which, while not seriously inaccurate, might with advantage be reworded: for instance "Lignin . . . becomes prominent only as the cell ceases to be metabolically active" (p. 22); "X-rays cannot be focused by lenses" (p. 87); "We shall see that when cotton hairs are considered by themselves, they form no exception" (p. 153); "Cambium, the tenuous living layer of the stem" (p. 155). The definition of the standard error of the mean of a simple sample (appearing unexpectedly on p. 117) will prove superfluous to the initiated, and to the beginner unedifying. The formula for the resolving power of a light microscope, quoted in the section concerned with electron microscopy (p. 86), may raise irrelevant queries as to what the factor 0·61 signifies, and precisely which refractive index is here intended.

Much may be forgiven an author, however, who ends his book with this quotation: "for although a Man shall never be able to hit Stars by shooting at them; yet shall he come much nearer to them than another that throws at Apples". And if the discussion in the final chapter takes us "somewhat beyond the bounds of established knowledge", we should feel privileged in being allowed such generous access to the mind of a research worker. It cannot be too strongly emphasized that scientific advances come usually only after periods of dogged and determined spade work, inspired by some preliminary speculation or flash of insight.

It may well be Dr Preston's major contribution to have drawn attention once again to this important tenet. J. P. R.

Thommen, E.
Taschenatlas der Schweizer Flora.
(Pocket atlas of the Swiss Flora).
Verlag Birkhäuser, Basel 1951 : Fr. 13·50 : Pp. xvi + 309 : figs.

Botanists, both amateur and professional, and teachers or students of botany interested in the flora of Switzerland and its neighbouring countries, will be gratified to know that a second and enlarged edition of Eduard Thommen's compact and comprehensive pocket atlas of the Swiss flora (cf. *Plant Breeding Abstracts*, Vol. XVII, Pp. 495–96) is now available. The second edition contains 3054 figures, including, in addition to species either new for the region or not included in the first edition, a number of cultivated or adventitious plants worthy of mention.

As additional aids in making a diagnosis, white flower colour is now expressly indicated and explanations of the abbreviations adopted for colours are repeated throughout the book at the foot of the pages.

As regards the International Rules of Botanical Nomenclature, the author decided that only specialists could keep abreast of the constant and extensive changes necessitated by recent taxonomic research, and has therefore relinquished any attempts to reform the nomenclature, except in the most obvious cases.

Phillips, E. P.
The genera of South African flowering plants.
Government Printer, Pretoria 1951 : 2nd ed. : 40s. : Pp. 923.

During the quarter century which has elapsed since *The genera of South African flowering plants* was published in 1926, many additions have been made to the existing records. A thorough revision of the first edition, which has for so long been the only comprehensive flora of South Africa, will therefore be welcomed not only by foresters, teachers, students and various government officials, as suggested by the South African Minister of Agriculture in his foreword, but also by many others who have made constant use of the previous volume. Altogether 142 new genera have been included, bringing the total to 1787. During recent years Dr Phillips has re-examined much of the material available at the National Herbarium, Pretoria, and substituted many of the descriptions, which were formerly compiled from literature, by his own detailed observations. Reference is, however, made to the original records, and the type species of each genus is also mentioned. Keys necessary for identifying families and genera are included. The arrangement of families follows the order adopted by the National Herbarium, after the system of de Dalla Torre and Harms.

Abrams, L.
Illustrated flora of the Pacific states. Vol. III. Geraniums to figworts.
Stanford University Press, California, USA 1952 : $17·50 or 140s. : Pp. v + 866 : figs.

The excellence of Professor Abrams's flora of the Pacific states has already been noted in the review of volume II of this important work (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 111). The present volume maintains the high standard of its predecessors, in particular the harmonious layout with the illustration of each species adjacent to the description.

The families treated in the present volume are those arranged by Engler under the Geraniales, Sapindales, Rhamnales, Malvales, Parietales, Opuntiales, Myrtiflorae and Umbelliflorae in the Archichlamydeae, and the Ericales, Primulales, Ebenales and Contortae in the Sympetalae. As in previous volumes, the taxonomic treatment is conservative. Startling departures from standard arrangements do not occur, nor does the author favour the current mania for genus splitting.

The specific descriptions are good with something of the crispness of the older Latin diagnoses. As observed in the earlier review, however, these would benefit from a brief indication of affinities and of the degree of isolation from congeners. The one feature that strikes a faintly ridiculous note is the studious confection of English names such as cobwebby Indian paint brush and white-bracted stick-leaf; perhaps such names are still *de rigueur* in floras, but surely anyone who has discovered what a bract is—and the term itself can hardly be regarded as current English—will not be baulked by the Latin *involucrata*, and the step from Jones's plagiobothrys to *Plagiobothrys Jonesii* does not seem insurmountable either.

In other respects the flora is a model production and a superb example of fine book printing.

Festschrift aus Anlass der Eröffnung der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin. **(Memorial volume in celebration of the opening of the German Academy of Agricultural Sciences in Berlin).**
Deutsche Akademie der Landwirtschaftswissenschaften, Berlin 1952 : Pp. 159 : Plates.

A full account is given of the official opening, on 17 Oct. 1951, of the new German Academy of Agricultural Sciences in Berlin. In the presidential address the aims of the academy are outlined. These include the production, by breeding, of improved strains of forage plants, potatoes, cereals and oil plants for the different climatic zones of the German Democratic Republic, cooperation with farmers' clubs and Mičurinite circles in putting into practice the results of research, and the study of the results of Soviet scientists in all branches of agricultural research. Dr H. Stubbe was appointed president of the academy.

Ordish, G.
Untaken harvest.
Constable & Company, Ltd., London 1952 : 15s. : Pp. xii + 170 : 4 figs. : 14 tables.

That pests and diseases do much damage to our crops is common knowledge. The object of this book is to examine just how great is the loss caused and to find some more convenient form of expressing this loss than the money value, which is shown to be in itself possibly misleading. The author prefers the concept of the waste of land and labour occasioned by our plant pests and arrives at the startling conclusion that this annual loss, described as the Untaken Harvest, is equivalent in Great Britain to the entire produce of some 33,000 farms, and for the world at large it is at least equal to the entire crop harvest of the USA.

The development of the thesis is graphic and convincing, if somewhat repetitive, and serves as a vessel for presenting information on the nature of the main pests and diseases of agricultural crops, and on the gradual development of the methods of combating them, from the time of Pliny, who recommended sprinkling plants with decoctions of wormwood and leek, to the modern age of DDT, hormone weed killers, systemic poisons and low-volume applicators; the benefits, both economic and social, of biological methods of control such as the use of resistant varieties and of pest predators also receive due mention, though with a certain note of caution.

There are certain scientific inaccuracies, such as the curious distinction between cryptogams and phanerogams which appears on page 2, and slight verbal inexactitudes such as the words *affected* on p. 38, *disutility* on p. 81 and *systemic* on p. 139, and Dr Salaman for some reason appears as J. Salaman in the index, but on the whole the book is well and attractively presented and ably serves its purpose of attracting attention to an important aspect of the wider issue of the world's dwindling food reserves.

Annual Review of Microbiology. Vol. 5.
Annual Reviews, Inc., California, USA 1951 : $6·00 : Pp. ix + 379 : figs. : tables.

In volume 5 of this excellent review, V. M. Cutter surveys the results of investigations carried out during the years 1935 to 1950 on the cytology of the different groups of fungi, the section dealing with the controversial subject of the structure of the yeast nucleus being of particular interest. A contribution by K. A. Bisset reviews recent research on the morphology and cytology of bacteria, discussing advances in various techniques for studying these organisms, the flagellar controversy, Imsenecki's artefact theory, the L forms in the bacterial life cycle, the cytology of bacteria infected with bacteriophage, and the relationships among different types of bacteria. J. J. Christensen and J. M. Daly examine the results of research on parasitic and cultural adaptation in the fungi. They emphasize the need for caution in interpreting the nature of changes in virulence and cultural characteristics, and point to instances of inadequacy of the data for the proof or disproof of the occurrence of such changes without involving genetic alterations. R. Y. Stanier surveys recent contributions on problems of enzymatic adaptation in bacteria, mainly discussing adaptation unaccompanied by a change in the genotype, but also some genetic aspects of enzymatic adaptation. Other papers dealing with bacteria and fungi comprise: Metabolism in bacteria, by G. N. Cohen; Metabolism of fungi, J. W. Foster; and Nutrition of bacteria and fungi, W. A. Krehl and S. J. Liao. The remaining twelve papers include: Physiology of the algae, J. Myers; Plant chemotherapy, J. G. Horsfall and A. E. Dimond; Pathological plant growth, A. J. Riker and A. C. Hildebrandt; Physical and chemical characteristics of viruses, J. W. Beard; and Interference phenomena between plant viruses, by C. W. Bennett.

Annual Review of Microbiology. Vol. 6.
Annual Reviews, Inc., California, USA 1952 : $6·00 : Pp. ix + 492 : figs. : tables.

Volume 6 maintains the excellent standard of previous numbers of this review. Of special interest is the contribution by R. Kaplan on the genetics of microorganisms, surveying research recently reported, chiefly in publications appearing in 1950 and 1951; it also includes some earlier investigations by the author. The long bibliography, containing no less than 320 references, is eloquent of the great importance now attached to the study of microbial genetics. Among the remaining 18 contributions are papers on: The coryneform bacteria, by H. L. Jensen; Classification and nomenclature of viruses, C. H. Andrewes; Identification of virus infection in plant tissue, J. H. Jensen; Nematodes parasitic on plants, B. G. Chitwood and B. A. Oteifa; Soil microbiology, A. G. Lochhead; Recent advances in the taxonomy of yeasts, L. J. Wickerham; Bacterial viruses, W. H. Price; Associations between microorganisms and higher plants (mycorrhiza), L. J. Harley; and Biological activities of metabolite analogues, by W. Shive.

Walker, J. C.
Diseases of vegetable crops.
McGraw-Hill Book Co., London 1952 : 64s. : Pp. ix + 529 : 117 figs.

In this book, the author has covered the entire range of diseases which attack vegetable crops of commercial importance in America, whether caused by fungi, nematodes, bacteria, viruses or environmental factors such as mineral deficiences, or by soil and climatic conditions.

For easy reference each chapter deals with a single crop or group of vegetables such as the crucifers. The history and distribution of the disease under review is first given with notes upon its economic importance. This is followed by a description of the symptoms by which the disease may be identified and the causal agent. Where the attack is due to fungal or nematode infection the morphology and life cycle of the organism are given in detail; if caused by bacteria or viruses, the physical properties and mode of transmission are considered. The discussion is concluded by a paragraph on control and, where relevant, on resistant varieties. Finally, an up-to-date list of references is given. The whole provides a concise and full account of all aspects of the disorder under consideration. Throughout the book are numerous photographs and diagrams to illustrate the text.

It is a pity that the price of this book puts it beyond the reach of most students. However it should prove a useful and popular addition to agricultural and botanical libraries. A. H.

Ainsworth, G. C.
Medical mycology. An introduction to its problems.
Sir Isaac Pitman & Sons, Ltd., London 1952 : 15s. : Pp. ix + 105 : 8 tables : 7 figs.

Medical mycology has for many years constituted a rather obscure study, largely because its study involves cooperation between two classes of research worker, clinician and mycologist, whose paths seldom cross. As a consequence both the diagnosis of mycoses and an understanding of the taxonomy of pathogenic fungi has proved difficult. In addition, the nosological and mycological approaches to the terminology and classification of mycoses have naturally led to divergent treatments.

Dr Ainsworth's introduction does not claim to resolve the many obscurities of the subject, but it does provide a vantage ground from which the interested reader can obtain his bearings. The aspects covered are the principal mycoses, the serology of the pathogens, fungus spores as allergens and poisonous fungi. Throughout the book, there is an emphasis on taxonomy, which, in view of the 87 synonyms of *Candida albicans*, is not surprising. The whole work provides both a useful introduction and also a valuable source of reference to the basic papers which are very widely scattered throughout the periodical literature.

Atti del Convegno di Genetica Agraria, Rieti, 30 maggio—2 giugno, Roma, 3 giugno 1950. (**Proceedings of the Congress of Agricultural Genetics, Rieti, 30 May—2 June, Rome, 3 June 1950**).
Tipografia del Libro, Pavia 1951 : 4000 Lire : Pp. xiii + 512 + 80 : figs. : tables.

The full proceedings of this meeting (cf. *Plant Breeding Abstracts*, Vol. XXI, Abst. 165) have now been published in a handsome volume which reproduces *in extenso* the remarks of the delegates at the inaugural and closing sessions, the papers presented at the scientific sessions and Italian versions of those delivered in other languages.

27e beschrijvende rassenlijst voor landbouwgewassen met bijlagen 1952. **(Twenty-seventh descriptive list of agricultural crop plants, 1952).**
Rijkscommissie voor de Samenstelling van de Rassenlijst voor Landbouwgewassen, Wageningen 1952 : Pp. 314 : tables.

The new edition of this invaluable booklet, accompanied by its commentary in English, has now been published by the Committee at Wageningen entrusted with its compilation. It needs no further recommendation to readers of *Plant Breeding Abstracts* (cf. Vol. XXII, p. 169) who may require information on the varieties of field crops grown in the Netherlands. Over 65 crops are included and, in addition to the English commentary, varietal synonyms are recorded under the various crops. The list of crop and species names in Dutch, Latin, English, French and German will assist foreign plant breeders and commercial seed firms to identify the different crops in the main portion of the Dutch text. French and German readers can, if they wish, be supplied with the commentary in their own languages, while complete translations of the section on potatoes are again available in English, French, German, Italian, Spanish and Portuguese, and of the sections on cereals, legumes and flax in French, English and German.

THOMAS, M.
Back crossing. The theory and practice of the backcross method in the breeding of some non-cereal crops.
Commonwealth Agricultural Bureaux, Farnham Royal 1952 : Tech. Comm. No. 16 of the Commonwealth Bureau of Plant Breeding and Genetics, Cambridge : 15s. : Pp. vi + 136 : tables.

Back-crossing is now firmly established as one of the most valuable techniques at the service of the crop breeder, and the method is particularly important in exploiting the genetic resources of wild material. Since Harlan and Pope first drew attention to the value of the technique in cereal breeding, back-crossing has been successfully applied not only to cereals, but also to several other crops, especially in the last decade or so. Mrs Thomas's bulletin concentrates upon four of these other crops. After a short introductory chapter on the theory and history of the technique, Chapter II surveys in considerable detail the highly important work carried out on back-crossing in cotton in the Sudan, United States and other countries, an account being given of back-crossing for good fibre properties, resistance to blackarm, *Fusarium* and *Verticillium* wilts, resistance to jassid and other pests, deciduous bractlets and suitability for mechanical harvesting. In Chapter III a survey is presented of the use of the method in tobacco breeding for resistance to mosaic, wildfire and other diseases, resistance to nematode, earliness, low nicotine content, smoking quality, yellow leaf colour, and petiolate leaves. Chapter IV surveys back-crossing in the tomato, its chief topic being investigations on *Lycopersicon pimpinellifolium* and other species for the transference of disease and pest resistance and high vitamin C content. The concluding chapter reviews the results of back-crossing with *Solanum* spp. and Müller's W races to introduce disease resistance and other characters into the cultivated potato. A conveniently separate bibliography completes each chapter of this useful bulletin.

HILL, A. F.
Economic Botany. A textbook of useful plants and plant products.
McGraw-Hill Book Co., Inc., London 1952 : 2nd ed. : 56s. 6d. : Pp. xii + 560 : 250 figs.

Since 1937, when the first edition was published (cf. *Plant Breeding Abstracts*, Vol. VIII, p. 88), many advances have been made in agricultural and forest practices and in the utilization of plant products. To a certain extent these inevitable changes were accelerated by war conditions. The war has also been responsible for the sudden interest in little-known species as substitutes for unobtainable strategic materials. Numerous medicinal plants, virtually unknown a few years ago, have become important as sources of new drugs, or new applications have been found for their properties.

In order to modernize this textbook, which has in the past proved its value for reference work, it is obvious that the subject matter has undergone complete revision and several chapters have been rewritten. Some 140 additional species are included, new illustrations have been added where appropriate and an attempt has been made to bring nomenclature up to date. The general presentation of chapters and the standard of the volume remain, however, the same. In spite of the wealth of new material the bibliography has not increased in size, as all references to papers published before 1936 have been omitted. A list of films suitable for supplementing subject matter on certain crops is an innovation which will probably be particularly helpful for teachers; film distributors in the USA are noted.

EFFERSON, J. N.
The production and marketing of rice.
Simmons Press, New Orleans, USA 1952 : $6·00 or 48s. : Pp. viii + 534 : 89 figs. : 101 tables.

It must be emphasized that this is not a detailed technical account of rice from any one particular aspect, but a general survey of the rice industry throughout the world, with the exception of the USSR. Much of the information on production methods, marketing practices and local problems in different countries results from personal observations made by the author during his tour of the important rice growing areas in 1948 and 1949, while serving as International Rice Specialist for the United States Department of Agriculture. The illustrations alone give an immediate impression of the wide range of conditions under which rice is produced; the methods are more varied than those used for any other major crop. It is in fact the first time that a complete survey of rice production has been attempted in a single volume.

Part I is introductory and includes the following: a botanical description with some indication of the different types preferred in particular regions, and of the numerous byproducts; a discussion of factors which have led to dependence on rice in so many countries; a comprehensive account of the trends in world production, culminating in the present position; a survey of world problems, with special reference to the necessity for international cooperation; and an outline of the current aims of the International Rice Commission sponsored by FAO.

The major part of the book comprises parts II, III and IV, dealing with production methods in Asia, Africa and Europe, and Latin America respectively. Each part is divided into sections concerning countries which are either self sufficient or have a surplus or a deficit. In addition to a detailed outline of the agronomic and economic problems in each country, well-supported by statistical data, methods by which many of these problems may be solved are suggested and future developments forecast.

Part V is concerned with the rice industry in the USA, where the author has carried out research on economic problems for 15 years.

Since the author is already well-known as a world authority on rice, it will hardly be necessary to recommend his book to rice breeders. The style and method of presenting the wide range of information clearly outweigh the occasional irritation caused by printing errors.

COYAUD, Y.
Le Riz. Étude botanique, génétique, physiologique, agrologique et technologique appliquée à l'Indochine. (**Rice. A botanical, genetical, physiological, agronomic and technological study, applied to Indochina**).
Arch. Off. Indochin. Riz., Saigon 1950 : No. 30 : Pp. 312 : 60 figs. : 21 tables.

SAENZ-LASCANO-RUIZ.
Contribution à l'étude des riz gluants. Les matières amylacées. (**Contribution to the study of the glutinous rices. The starch substances**).
Arch. Off. Indochin. Riz., Saigon 1950 : No. 28 : $27·50 : Pp. 41 : 15 tables : 13 plates.

Documents which formed the basis of lectures for the course in rice culture at the Higher College of Agriculture and Sylviculture of Indochina at Hanoi from 1938 to 1945 provided the material for the first of the two publications under review. For this reason not all aspects of rice cultivation have been considered equally fully. Detailed treatment has been given to the study of the plant and of the environment in which rice cultivation is carried on in Indochina and also to the application of technical measures to the special circumstances of Indochinese cultivation, as exemplified particularly by conditions in northern Viêt-Nam, where the crop receives special care. Other subjects have been less fully treated, since they are dealt with in other courses of instruction.

The volume contains much of value to rice breeders and especially those interested in the rices and methods of cultivation in Viêt-Nam. Chapter I, which deals with the rice plant and its classification, comprises sections on the characteristics of the inflorescence, spikelet, grain, stem and leaves, and also a section on biological characteristics, e.g. the vegetative period, types of anthesis, sterility, malformations of the panicle, water requirements, shedding, lodging, hardiness and resistance to cold and pests, and the value of these characteristics in classification. Chapter II deals with the development of rice cultivation, the effects of environment on the plant, and conditions in Indochina. A section on the rice varieties of

Indochina includes a useful tabular survey of their main features and their agricultural and commercial qualities. Chapter III deals with cultivation, and Chapter IV with water supply, soil analysis, manuring and breeding and genetics, with special reference to the methods employed in Indochina. Chapters V, VI and VII concern the grain and straw, economic problems and the technology of rice.

Though considerable advances had been made before the war in breeding and pedigree selection at Battambang in northern Viêt-Nam and in Cambodia, hybridization work having been begun in both these districts, much valuable plant material was subsequently destroyed. The Rice Office has, however, taken up the work again, though with limited means at its disposal. The primary need at present appears to be the organization of the production and distribution of selected seed to farmers.

In spite of its origin from the material for a series of separate lectures, the book shows a logical, if somewhat unorthodox, development; and the numerous footnotes contain valuable information supplementing the text without interfering unduly with the continuity of treatment. There is also a bibliography of 240 references grouped according to the chapters.

It is a book well worth reading and possessing by the practical expert and the research man interested in rice cultivation and breeding in Indochina.

As a useful supplement to the above volume, attention may also be directed to the second publication on different varieties of glutinous rices, with special reference to Indochina. This study is prefaced by an introduction by Mons. Y. Coyaud on the proposed establishment of a rice collection as the preliminary step in a selection programme for which the starch analyses carried out and here recorded by Mme Saenz-Lascano-Ruiz will provide a sound scientific basis.

VAN DILLEWIJN, C.
Botany of sugarcane.
The Chronica Botanica Co., Waltham, Mass., USA and Wm. Dawson & Sons, Ltd., London 1952 : $6·00 : Pp. xxiii + 371 : 229 figs. : 86 tables.

As the author points out in his preface, sugar cane compares unfavourably with many other commercial crops as far as reference books are concerned. Most of the published research is widely scattered and the few books deal only with local cane growing methods in certain regions. Therefore, for those interested in the botany of sugar cane this first attempt at collating all available literature will be especially useful, particularly as the task has been carried out by one who has had first hand experience of cane research in Java and the USA, and is now the sugar cane expert of FAO. It is not surprising that the survey is both authoritative and comprehensive.

The contents are divided into two main sections. Morphology and anatomy are considered in one section, where the text is well supplemented by photographs and line drawings. As the latter are reproduced from original papers they are of varied and often contrasting styles, and in close succession create rather an odd effect in a book which is otherwise uniform and very well produced. The other section, dealing with physiology, comprises chapters on germination, tillering, growth, vegetative and chemical composition, nutrition, water relations, photosynthesis and respiration. A certain amount of overlapping between chapters dealing with physiological aspects which are closely interrelated is inevitable, but careful indexing and a very detailed treatment of the list of contents for each chapter facilitate quick reference. From such a general survey it is at once noticeable that some physiological problems have received much more consideration than others; for example, photoperiodism, which is receiving considerable attention in several countries, is scarcely mentioned. The need for research on problems which have been neglected is stressed where appropriate. It should be noted that in many instances the application of research to breeding problems is emphasized.

WICKIZER, V. D.
Coffee, tea and cocoa. An economic and political analysis.
Stanford University Press, California and Geoffrey Cumberlege, Oxford University Press, London 1951 : $5·00 or 40s. : Pp. xiii + 497 : 16 charts : 12 maps : tables.

This analysis of the economy of coffee, tea and sugar as world commodities is the first of a series of studies whose preparation has been planned by the Food Research Institute of Stanford University, under the general title of Food, Agriculture, and World War II. For anyone wishing for information on the economic and political complexities of the production of these morale-sustaining beverages, this thorough and up-to-date survey is the answer. Part I deals with coffee, under the chapter headings: evolution of the coffee economy; some aspects of coffee growing and marketing; changes in production, trade and consumption; coffee and world war II; and postwar developments and problems. Part II surveys the economics of tea production, describing the development and characteristics of the industry; culture, manufacture and marketing; effects of regulation of production and exports; British management of the wartime trade; and reorientation of the postwar industry. Part III covers the rise of the modern cocoa economy; some problems of cocoa production, including those of swollen shoot and other diseases and pests; evolution of the industry; impact of the war on cocoa; and the critical postwar cocoa situation. In Part IV, current trends and problems for all three commodities are discussed in chapters on demand, consumption and competition; postwar problems and production; and tropical crop production in evolution. Appendices giving various statistics of production and a short selected bibliography complete the analysis.

Condit, I. J.
The fig.
Chronica Botanica Co., Waltham, Mass., USA and Wm. Dawson & Sons, Ltd., London 1947 : $5·00 : Pp. xv + 222 : 12 tables : 27 figs.

The cultivation of the fig is one of the more specialized branches of horticulture; it involves, for instance, in the case of the varieties of Smyrna figs, the transference of pollen by means of caprification. General accounts of this crop, such as the standard works by Solms-Laubach and Eisen, are both rare and out of date, so that a new comprehensive book, such as Professor Condit has written, is most welcome. The aspects considered by the author are the history and folk-lore of the fig, the general botany and taxonomy, caprification, breeding, varieties, regions of production, cultivation, processing, food value, marketing and pathology. The section on breeding is chiefly concerned with American work. The whole monograph provides a very good introduction to its subject; it is attractively written and well illustrated, and, both as an introduction and as a source of reference, is likely to prove of value for many years to come.

Richards, P. W.
The tropical rain forest.
Cambridge University Press, London 1952 : 63s. : Pp. xviii + 450 : 39 tables : 43 figs. : 15 plates.

Ecology was born in temperate North America. Its longitudinal diffusion was rapid and easy, but its latitudinal progress, especially towards the equator, has been rougher going, to such an extent that many students have come to doubt whether the general synecological principles first enunciated by Clements have any more than a local validity. The line of investigation that has proved most pertinent to this question has been the study of the structure and dynamics of tropical forests, about which far too little is as yet known, since these so often fail to show the ecological dominance or codominance of one or a few tree species so integral a part of the Clementsian scheme. It is therefore of the greatest interest to read a monographic account of the ecology of tropical forests by an author with considerable first hand experience of his subject matter.

Professor Richards deals systematically with the whole range of tropical forest synecology, with the exception of biotic factors, concerning which knowledge is still too fragmentary to collate. Part I of the book deals with the delimitation and description of synusiae, stratification and the ecologically relevant morphological characteristics of the component species. Part II is devoted to the influence of climate, seasonal changes and edaphic factors. In Part III, detailed descriptions are given of what are regarded as climax communities, to be followed, in Parts IV to VI by parallel treatments of xeroseres, in particular the recolonization of Krakatau, hydroseres, beach communities, tropical deciduous forests, savannas, montane forest, and secondary rain forest. A postscript outlines the urgent problems presented by the rapid exploitation of virgin tropical forest in recent years.

The whole account provides a vivid and comprehensive introduction to a plant community very dissimilar to any existing in more temperate regions. It also shows how many practical difficulties attend tropical ecology, with its necessity for employing native tree finders and utilizing vernacular names. With regard to the theoretical framework, the author emphasizes that our present state of knowledge is too scanty for extreme precision, and that, for dearth of a better, he has utilized the general principles of the Anglo-American school. It is this choice that bewitches the reader into dreaming that he is wandering between the gnarled moss-laden trunks that loom out of the mist in the elfin woodland so characteristic of the upper reaches of tropical mountains. Trees are always in sight, but at times the mist thickens and the sense of unreality grows, especially when the number of tree strata is being considered or discrimination is being attempted between consociations differing only in the proportions of their components. Now and then, as when Aubréville's cyclical theories are being discussed, one feels that the mists are clearing, but the general impression remains that the theoretical framework has, in too many cases, clouded rather than cleared the issue. However, it will only be through such comprehensive accounts as the present that sufficient data will become available for adequate research into the theoretical foundations of ecology, and all botanists will be grateful to Professor Richards for the valuable contribution he has made to this end.

NEW JOURNALS

Bulletin d'Information de l'Institut National pour l'Étude Agronomique du Congo Belge.

The aim of this new quarterly journal, which appears as an appendix to the Bulletin Agricole du Congo Belge, regularly reviewed in *Plant Breeding Abstracts*, is to disseminate results of essentially practical interest arising out of the agricultural research in progress in the Belgian Congo.

The Nebraska Experiment Station Quarterly.

A free quarterly periodical is now being published by the Nebraska Agricultural Experiment Station as part of the annual report, so that farmers may make practical use of the results of research more promptly than has previously been possible. The first issue contains six articles which are all relatively short, written in a popular style and copiously illustrated.

Proceedings of the Bihar Academy of Agricultural Sciences.

The Bihar Academy of Agricultural Sciences is now publishing papers reporting original research on crop breeding and genetics and other agricultural topics in a journal which is to appear in three numbers per year. Price of single copy, Rs. 3/8; annual subscription Rs. 10. Further information may be obtained from the Secretary of the Academy, Agricultural Research Institute, Sabour, Bihar, India.

INDEX

Abbasi, F. H., 312
Abdul Hafiz, 792
Abdur-Rasheed Mohajir, 338
Abe, S., 715
Aberion, R. B., 381
Abrams, L., p. 161
Adair, C. R., 374
Adatia, R. D., 799
Agati, J., 555
Ahmad, M., 158
Ainsworth, G. C., p. 163
Akeley, D. F., 474
Åkerberg, E., 420
Åkerman, Å., 204, 214, [251]
Alandia Borda, S., 458
Albuquerque, R. M., 51
[Aldous, E.], 5
Aleksandrov, S. V., 739
Alekseeva, M. V., 724
Alexander, D. E., 303
Alexander, P., 46
Allison, J. L., 428
Alonzo, J. C., 308
Alpatjev, A. V., 286
Ames, B. N., 142
Aminul Islam, M., 504
[Anderson, E. H.], 5
Andersson, G., 569
André, É., 575
Andrew, R. H., 794
Angulo Carpio, M. D., 716, 762
Anon, 4–6, 32, 104, 115, 164–5, 167–9, 171–3, 175, 177–84, 186, 195–7, 222, 251, 263, 271, 322, 336, 342–3, 351, 356, 359, 363, 378, 383, 391, 396, 398, 415, 422, 429, 431, 441–2, 450, 469, 484–5, 495, 508–9, 518, 521, 526, 528, 542, 544, 557, 559, 561, 579, 587–9, 594, 598, 608, 619, 623, 632, 656, 658, 660, 669, 678, 697, 704, 710, 737, 749, 753, 759, 778, 795, p. 156, p. 162, p. 163, p. 164
Anselmi Laukin, M. S., 451
Appel, G. O., 452
Apurba Kumar Ghose, 585
Argikar, G. P., 790
Arisumi, T., 604
Armellini, S., 645
Arnold, C. R. F., 287
Arnon, J., see Arnon, Y.
Arnon, Y., 416
Arny, D. C., 275, 338
Artemova, A. S., 219
Arutjunova, L. G., 490
[Astrego, J. J.], 598
Atwood, K. C., [5], 105
[Auerbach, C.], 5
Aufhammer, G., 326
Aycock, R., 481–2
Ayers, A. D., 239

[Babcock, E. B.], 6
Baer, B. S., 122
Baharev, A. N., 601
Bailey, C., 599
Bailey, J. E., 796
Bailey, N. T. J., 59
[Baker, W. K.], 5
Balašev, N. N., 447
Balasubrahmanyan, R., 789, 791
Balasubramanian, R., 494
Baldacci, E., 379
Baldin, P. G., 744
Baldini, E., 564
[Baltzer, F.], p. 158
Banducco, E., 500
[Banga, O.], 598
Barak, D., 615
[Barigozzi, C.], 6
Barrales, H. L., 419
Barreto, R., 527
Barrett, H. C., 604
Bartholomew, J. W., 148
Barton-Wright, E. C., p. 160
Baskett, A. C., 111
Batra, S., 732
Bauch, R., 15
Baver, L. D., 510
[Bawden, F. C.], 104
Bayles, B. B., 246
Bayubay, S., 555
[Beard, F. H.], 594
Becker, W. R., 313
Becquerel, P., 98–9
Beijerinck, W., [598], 638
Bell, R. S., 390
Bensin, B. M., 453
Berdacou, J., 143
Berger, C. A., 55
Bever, W. M., 269
Bhattacharjee, D., 53
Bianchi, A., 296
Billen, D., 107
Bisset, K. A., [5], 117
Björklund, C. M., 435
Black, W., 457
Blackman, G. E., 578
Blaringhem, L., 570
Bocanegra Salazar, S., 290
Boerger, A., 185
Bolsunov, I., 545, 552
Bonde, R., 474
Bonisconti, V., 500
Bonner, D. M., [5], 138
Bonnett, O. T., 269
Bor, N. L., 387
Borlaug, N. E., 246
Borne, L. A., 525
Bounds, E., 782
Boyce, J. S. (Jun.), 127
Boyd, A. E. W., 461–4
Brachet, J., 39, [p. 158]
Bramble, W. C., 703
Braun, W., 112
Bredemann, G., 505
Bremer, G., 192
Bremer-Reinders, D. E., 192
Brežnev, D. D., 739
Brieger, F. G., 62
Brimhall, B., 311
Brittan, N. H., 424
Brittingham, W. H., 769
Brown, D. S., 603
Brown, J. W., 239
Brown, M. S., 487
[Brown, R.], p. 159
Brücher, E., 405
Bryson, V., 121, 125
Bryzgalov, V. A., 706
Budin, K. Z., 445, 454
Budjuk, V. P., 240
Bünning, E., 60
Bunting, E. S., 578
Burton, G. W., 403
Butler, J. A. V., 45
Buzacott, J. H., 507
Byrnes, W. R., 703
Bystraja, M. F., 489

Cabrera, M. R., 513
Cadman, C. H., [594], 647–8
Calabresi, G. A., 201
Caldas, L. R., 150
[Callan, H. G.], p. 158
Calma, V. C., 381
Cameron, D. R., 549
Cameron, J. W., 309
Campbell, J. A., 625
Campos T., A., 246
Capinpin, J. M., 305, 308
Carbouère, M., 575
Carles, J., 310
Carter, T. C., 12
Cartter, J. L., 782
[Caspari, E.], 6
Černetčenko, V. S., 706
Chambers, P. C., 252
Chamblee, D. S., 428
[Chase, M.], 5
Chaudhuri, S. D., 504
Chavancy, A., 174
[Chayen, J.], p. 159
Chen, S.-Y., 145
Cheo, P.-C., 730
Chevet, L., 570
Childers, W, R., 414
Christiansen, H., 700
Chuan, L. T., 519
Čigrin, V. N., 671
Ciumei, G., 257
Clapper, R. B., 681
Clarke, A. E., 720
Clarke, W. S., 613
[Clausen, R. E.], 6
Cleverdon, R. C., 116
Cochran, F. D., 721
Collier, J. W., 295
Collister, E. H., 267
Condit, I. J., p. 167
[Coons, A. H.], p. 157
Cooper, D. C., 65
Copp, L. G. L., 234
Corbetta, G., 379

Corillion, R., 434
Corti, R., 61
Constantin, T., 150
Coyaud, Y., p. 165
Cram, W. H., 689
Cramer, P. J. S., 590
Crockett, S. P., 625
Cruickshank, I. A. M., 786
Čulkova, E. I., 727
Cummings, W. H., 698
Cvetkov, M. I., 243

[Dalcq, A.], 6
D'Amato, F., 73, 84
[Danielli, J. F.], p. 156
[Davey, V. M'M.], 4
[Dark, S. O. S.], 561
d'Armancourt, H., 357
Darrow, G. M., 602, 653, 657
Datta, R. M., 367, 501
Davidson, H., 125
Davies, F. F., 348
Davis, R. L., 408
Dean, A. C. R., 110
DeFrance, J. A., 390
[DeLamater, E. D.], 5
Delay, C., 40
De Litardière, R., 397
DeLorenzo, W. F., 155
[Demerec, M.], 5
Demišev, K. S., 227
Denoy, I., 357
De Roo, R., 386
Deshmukh, M. J., 256
Deshpande, R. B., 576
[De Silva, C. A.], 588
de Sonnaville, P., 27
Deufel, J., 280–1
Devaux, H., 56
De Vecchi, E., 365
Devi, P., 106
Deysson, G., 70, 72, 74–5, 92
Deysson, M., 82, 92
Diannelidis, T., 722
Dick, I. D., 2
Dicke, F. F., 321
Dickson, J. G., 316
Dimmock, F., 772
De Prima, S., 640
Dirks, V. A., 207
Dmitriev, V. S., 33
Dolcher, T., 654
Donnelly, E. D., 412
Dorfschmid, M., 272
Dorst, J. C., 189
Doudney, C. O., 140
Duara, B. N., 400
Duarte, A. J. S., 362, 364
Duffield, J. W., 702
Duka, S., 595
[Duncan, E. N.], 485
Dunegan, J. C., 618

Eden, W. G., 323
Efferson, J. N., p. 165
Ehrenberg, L., 325, 605
Eichhorn, A., 63
Einset, J., 610
Elagin, I. N., 260
Elle, T., 340
Ellenwood, C. W., 612
Elliott, C. S., 577
E-n., G., 329
[Endo, T.], 171
[Ephrussi, B.], 5
[Ephrussi-Taylor, H.], 5
'Espinasse, P. G., 34
Eynden, G. P. A. v. d., 407

Fajersson, F., 236
Federer, W. T., 1
Fedorenko, M. M., 596
Feĭcarenko, A. I., 327
Ferret, M., 427
Filipčenko, I. M., 659
Findley, W. R. (Jun.), 319
Fischnich, O., 443
Fisher, H. H., 767
Fleming, A. A., 293
Fleschner, C. A., 630
Flor, H. H., 496
[Flory, L. E.], 5
Forrest, A., 37
Fors, A. L., 520
Fowell, R. R., 157
Fox, M., 46
Frandsen, N. O., 768
Franzke, C. J., 349
[Frey-Wyssling, A.], p. 159
Friedmann, E., 59
Fröier, K., 204
Frischknecht, N. C., 404
Frost, H. B., 639
Fujiwara, I., 161
Fukasawa, H., 217
Fukui, J., 775
Fukunaga, E. T., 641
Fukushima, E., 711
[Furusato, K.], 171

Gadea, M., 255
Gadet, R., 310
Gallegly, M. E., 755
Ganguly, A., 471
Gardé, A., 79, 159, 385, 709
Gardner, E. J., p. 155
Garrigues, R., 684
Gaskill, J. O., 535
Gaussen, H., 695
Gavaudan, N., 87, 89, 91
Gavaudan, P., 86–7, 89–91
Gelin, O. E. V., 476
Gentile, G., 624
George, D. W., 350
[Gerritsen, C. J.], 598
Ghani, M. A., 493
[Giles, N. H. (Jun.)], 5
Gluščenko, I. E., 31
Goertzen, K. L., 611
[Goldacre, R. J.], p. 157
Goldschmidt, R. B. [5], p. 155
Goldstein, A., 118
Goldsworthy, M. C., 618
Goodlow, R. J., 112
Goodwin, T. W., 752
Gordienko, V. A., 780
Gori, C., 85
Gorter, C. J., 100
Gothe, H., 694
[Gotoh, K.], 171
Grafius, J. E., 200, 207
Graham, T. W., 554
Grandjean, F., 35
Granhall, I., 600, 605
Grebenskaja, M. I., 633
Greenleaf, W. H., 566, 758
Greenwood, M. L., 449
Grente, J., 636
Guilbeau, S., 480
Guilbeau, W. F., 517
Gustafsson, Å., [5], 328
Gutierrez, M. E., 555

Haas, F., 142
Hadden, S. J., 265
Haddox, C. H., 137
Hagberg, A., 276, 328
Hamilton, R. A., 641
Hänsel, H., 332
Hansen, H. H. H., 198
Hänsl, H., 163
Hanson, A. A., 389
Hanson, C. H., 428
[Hanson, J.], 5
Haritonova, E. N., 621
Harrington, J. F., 731
Harris, R. V. [594], 647–8
Hartwig, E. E., 782
Harvey, P. H., 352
Harvey, P. N., 193
Haskins, F. A., 132
Havas, L. J., 754
Hawkins, A., 449
Hawthorn, L. R., 720
Hawthorne, P. L., 734
Hazina, E. P., 743
Hedin, L., 306
Hegwood, M., 599
Heilweil, H. G., 54
Heilweil, I. J., 54
[Heitz, E.], 6
Hely, F. W., 409
Hendriksen, A. J. T., 537
Hepting, G. H., 127
Hernández, J. M., 516
Hernes, O., 274
[Hershey, A. D.], 5
Hestrin, S., 154
Heusner, A., 754
Hewitt, E. J., p. 159
Higginbottom, C., 106
Hill, A. F., p. 164
Hinshelwood, C., 110
Hitier, H., 88, 546–7
Hjelmqvist, H., 203
Hmelev, B. I., 229–30
[Hoblyn, T. N.], 594
Hochberg, N., 666
Hocquette, M., 49
Hoeser, R., 235
Hoffmann-Ostenhof, O., 77
Höhne, G., 26
Hollaender, A., [5], 107
Holmberg, S. A., 771
[Holmes, J. C.], 4
[Holmgren, O.], 251
Honkavaara, T., 216
Hooker, A. L., 316
[Horowitz, N. H.], 5
[Hotchkiss, R. D.], 5
[Hottinguer, H.], 5
Hovey, C. L., 474
Howlett, F. S., 612

Hrishi, N. J., 347
Hsia, Y. J., 519
Hudson, W. J. C., 409
Huelsen, W. A., 301
[Hughes, A.], p. 158
Hughes, C. G., 523
Hughes, W. H., 123
Hughes, M. B., 481–2
Hugues, P., 427
Humphrey, L. M., 783
Hurt, B. C., 625
Hutchcroft, C. D., 294
[Hutner, S. H.], 5
Hutton, E. M., 473

Iljina, A. I., 572
Ingersoll, F. S., 315
Inkilä, O., 787
Isaev, S. I., 614
Isely, D., 317
Izard, C., 546–7

Jacquin, P., 617
Jagoe, R. B., 583–4
Jakovlev, A. V., 219
Jamikorn, M., 752
Jarløv, H. C., 686
Jenkins, J. A., 741
Jenkins, M. T., 288, 319
[Jensen, K. A.], 5
Jensen, R. A., 699
Jeswani, L. M., 576
Jinks, J. L., 103
Johansen, R., 475
Johnson, A., 685
[Johnson, B.], 485
Johnson, P. E., 269
Johnsson, H., 677, 683, 687
Johnstone, F. E., 733
Jones, D. K., 248
Jones, D. L., 492
Jones, H. A., 713
Jones, J. W., 361
Joseph, T. C., 55
Julén, G., 204, 417
Jungfer, E., 331

Kanda, M., 380
Kanezawa, R., 701
Kanki, H., 715
Kaplunovskiĭ, S., 282
Karasawa, K., 776
Karska, K., 238
Kassanis, B., 556
Katayama, M., 729
Katayama, Y., 218, 360
Katsumata, H., 715
[Katz, B.], p. 156
[Kaufman, B. P.], 6
Kawase, T., 333
Keck, K., 77
Kehr, A. E., 550, 717
Keitt, G. W., 141
Kelly, A. F., 262
Kelly, E., 748
Kennerly, A. B., 337
Kepel, W., 430
Kerle, W. D., 324
Kern, H., 757
Kerr, W. E., 62
[Kers, D.], 598
Keuls, M., 3
Kiellander, C. L., 692
[Kihara, H.], 171
Kimura, M., [171], 226
King, E. D., 78
[Kirk, I.], 5
Kirk, L. E., 354
Kishore, H., 191
[Kitching, J. A.], p. 157
Kivi, E. I., 250
Klečka, A., 277
Klein, L. G., 649
Klimenko, K. T., 627
Klimenko, V. N., 627
Kloen, D., 436
Klykov, A. P., 781
Knight, C. A., 160
Kobayashi, T., 571
Kodani, M., 58
Kolesnikov, M. A., 622
[Kølmark, G.], 5
[Komai, T.], 171
Kondrackiĭ, A. A., 672
Koopmans, A., 446
Kozelnicky, G. M., 297
Kraft, M., 112
Krahl-Urban, J., 679
Kramer, H. H., 267
Krasočkin, V., 705
Kravčenko, P. A., 673
Kress, H., 438
Krickl, M., 284
Kriviskiĭ, A. S., 102
Krjučkova, A. F., 447
Kronenberg, H. G., 655
Krueger, A. P., 122
Kumar, L. S. S., 635, 736
Kurita, M., 723
Kuriyama, H., 373, 440
Kuwada, H., 503
Kuykendall, G. H., 350
Kuzjmin, A. Ja., 668

Lafferty, H. A., 395
Laing, T. J., 334
Lamardelle, P., 69, 71
Lambert, J. W., 334
Lamp, H. F., 392
Langham, D. G., 573
Langner, W., 680
Lanham, U. N., 36
Lanza, F., 291–2
Larson, R. E., 746
Lasschuit, J. A., 592
Lašuk, G. I., 563, 593
Laudanski, F., 632
Laude, H. H., 215
Laughnan, J. R., 298
[Lawley, D. N.], 4
Lawrence, R. E., 782
[Lederberg, E. M.], 5
[Lederberg, J.], 5
Lefèbvre, J.-M., 306
Lein, J., 133
Lein, P. S., 133
Lemos-Pereira, A. de, [6], 93–4
Lesley, J. W., 639
Leuchtenberger, C., 44
[Leupold, U.], 5
[Levan, A.], 5
Lewis, C. F., 486
[Lewis, E. B.], 5
L'Héritier, P., [5], 13
Lima-de-Faria, A., 29, 278
Lincoln, R. E., 742
Lindegren, C. C., 149, 151–2, 154, [p. 159]
Lindegren, G., 149
Lindenbein, W., 109
Lisavenko, M. A., 650
Lison, L., 41–2
Litovčenko, A. L., 212
[Lively, E. R.], 5
Ljaščenko, E., 539
[Loffredo, M. S.], 485
Longley, A. E., 299
Lorz, A. P., 764
Lovčikov, I. S., 240
[Löve, Á.], 6
[Löve, D.], 6
Love, H. H., 376
Lübbert, G., 443
Lücke, V. H., 696
Lucke, W. H., 151
Ludwig, R. A., 419
[Luria, S. E.], 5
Lwoff, A., 126
Lysenko, T. D., 33, 205

McCarty, C. D., 639
[McClintock, B.], 5
McColloch, L. P., 756
McFarland, E. F., 486
McGrew, J. R., 553
McKendrick, M. H., 449
[Mac Key, J.], 251
McKibben, G. E., 269
Mackinney, G., 741
Maes, E., 237
Magrou, J., 388
Maheshwari, P., 202
Mai, W. F., 465, 760
Maille, M., 575
Mainland, G. B., 11
[Mainx, F.], 6
Makarovskiĭ, A. F., 735
Malheiros-Gardé, N., 79, 709
Manarte, M., 81
[Manton, I.], p. 159
Manzer, F. E., 474
Manzoni, L., 675
Marčenko, I. I., 712
Marchand, H., 17–9
Mariat, F., 388
Marie, R., 357
Markert, C. L., 139
Marquardt, H., 14, 68
Marrian, D. H., 59
Mascré, M., 75
Massacesi, 646
Massey, P. H. (Jun.), 455
Matsumura, S., [171], 223, 538
Matsuo, T., 355
Maugini, E., 616
Maury, P., 310
Mazzani, B., 574
Mazzoni, G., 221
Mead, D. M., 112
Meiners, J. P., 393
Meletti, P., 95
Mendes, E. J., 506

Menkes, J., *see* Menkes, Y.
Menkes, Y., 426
Menzel, M. Y., 487
Mercado H., C., 751
Merriam, D., 474
Mertz, E. T., 408
Messeri, A., 643
Meurman, O., 607
Meyer, J., 52
Michael, R., 477
[Michaelis, P.], 5
Miège, E., 488
Mikaelsen, K., 67
Mikell, J. J., 480
Mileško, A. F., 609
Miller, J. C., 480
Miller, P. A., 311
Miller, P. W., 661
Minckler, S., 149
Miravalle, R. J., 288, 788
[Mirsky, A. E.], 5
Mirzabekjan, P. O., 124
Mitchell, H. K., 132, 134–5, 142
Mitchell, M. B., 134–5, 142
[Mitchison, J. M.], p. 157
Mittwer, T., 148
[Miyazawa, A.], 171
Mizushima, U., 258, 437
Mochizuki, A., 538
[Moewus, F.], 6
Mohammad Afzal, 493
Montaldo B., A., 466
Montanari, V., 187
[Moon, F. E.], 4
Moon, H., 618
Moore, J. F., 728
Morettini, A., 645–6
Morinaga, T., 373, 440
Moriya, A., 511
Morris, G. P., 199
Morris, R., 307
Morrison, J. W., 225
Morrow, E. B., 653, 657
Mortensen, J. A., 769
Muhin, N. D., 232
Mukherjee, S. K., 586
Müller, K. O., 457
Multamäki, K., 273, 421
Munger, H. M., 175
Müntzing, A., [6], 279
Murakami, K., 258
Murty, G. S., 256
Myers, W. M., 389

Nagao, S., 358, 372
Nagata, T., 774, 779
Nakagawa, M., 244
Nakausa, T., 726
Nakazawa, A., 228
Naldi, L., 285
Nalivaĭko, Ju. S., 562
Nayar, K. V. N., 491
Nazir Ahmad, 493
Nečiporčuk, I. D., 231
Nelson, R., 798
Neubauer, H. F., 670
Newcomer, E. H., 116
Newton, A. C., 309
Nickl-Navratil, H., 497
Nielsen, L. W., 483
Nikolaeva, T., 211
Nilova, V. P., 253
Nilsson, R., 435
Nishimura, Y., 300
Nishiyama, I., 264
Niwa, T., 399
Noguchi, Y., 581
[Novick, A.], 5
Nuždin, N. I., 33
Nybom, N., 325, 328

Oberle, G. D., 611
Odland, T. E., 390
Ogilvie, A. C., 120
Ogur, M., 149
Ohnishi, *see* Onishi, K.
Olah, L., 536
Olmo, H. P., 667
Onishi, K., 773
Oparin, A. I., 33
Opsahl, B., 190
Ordish, G., p. 162
Ordynskiĭ, V. V., 706
Orellana, E., 762
Orlovskiĭ, N. I., 530, 540
Osler, R. D., 782
Overcash, J. P., 625
Owczarzak, A., 101

Pack, F. C., 580
Pal, B. P., 194, 761
Palleroni, N. J., 152
Palmer, T. P., 220
Paredes C., A., 30
Parnačev, P. V., 213
Partridge, C. W. H., 138
Pasteels, J., 41–2
Pate, J. B., 502
Pathak, G. N., 793
Pauley, S. S., 685
[Pearce, S. C.], 594
Pendleton, J. W., 269
Penny, L. H., 321
Pesola, V. A., 166, 216, 250
Peterson, A., 119
Peterson, C. E., 713
Peterson, L. C., 465
Petit, C., 22
Petrov, E. U., 691
Peynaud, É., 620
Pförtner, K., 707
Phillips, E. P., p. 161
Piacco, R., 375
Pimentel Gomes, F., 20
[Pintner, I. J.], 5
Pirschle, K., 96–7
Pittenger, T. H., 135
Planck, R. W., 580
Plummer, A. P., 404
Plus, N., 13
Podmogaeva, M. I., 735
Pohjakallio, O., 266, 268
Pollack, B. L., 746
Pollard, L. H., 720
Pomper, A., 146
Pomper, S., 144
Pontecorvo, G., 106, 128–9, [p. 158]
Poole, C. F., 479
Pope, H., 119
Popov, A. V., 531
Popov, V., 606
Porter, J. W., 742
[Portsmouth, G. B.], 557
Posnette, A. F., 560
Pound, G. S., 730
Poussel, H., 89
Prakken, R., 745
Preston, R. D., [p. 159], p. 160
Pridham, T. G., 156
Probst, A. H., 777
Prohorov, N. K., 629
[Provasoli, L.], 5
Prudhomme, V., 49
Pruglo, V. V., 765
Puri, G. S., 690

Quastler, H., 763
Quenouille, M. H., p. 154
Quidet, P., 88

Radhakrishna Rao, C., p. 154
Raghavan, T. S., 512
Rajagopalan, N. S., 634
Ramanujam, S., 38
Ranade, S. G., 635
Randolph, L. F., 314
Ranganathan, B., 147
Raper, J. R., 8
Raper, K. B., 156
Raševskaja, V. F., 253
Rattray, A. G. H., 162
Ray, G. L., 371
Ray, L. L., 492
Rebischung, J., 238
[Redfield, H.], 5
Reeves, J., 247
[Reith, W. S.], p. 159
Reitz, L. P., 242
Resende, F., 81
Rezende-Pinto, M. C. de, [6], 93
Ribeiro, A. P., 558
Richards, P. W., p. 167
Rick, C. M., 750
Rigot, N., 472
Rijo, L., 506
Riley, H. P., 7
Riollano, A., 514
Robert, A. L., 319
[Roberts, R. B.], 5
Robertson, A., 12
Robertson, D. S., 304
[Robinson, E.], p. 159
Robinson, J. L., 294
Robson, D. S., 1
Rodionov, A. P., 626
Rodriguez, M., 573
Rogers, J. S., 295
[Rogers, W. S.], 594
Rohlfs, L., 570
Rohmeder, E., 688
Roland, G., 470
Rollen, A., 70, 72, 74, 76
Roper, J. A., 129–30
Ross, J. G., 349
Rosser, D., 249
Rothfels, K. H., 108
Roy, R. S., 662
Rübensam, E., 28
Rubin, B. A., 66
Rudin, V. D., 401
[Runnström, J.], p. 157
Ryan, F. J., [5], 113
Ryžeeva, O. I., 582

Sachs, L., 224
Saenz-Lascano-Ruiz, p. 165
Safran, B., 666
Sakai, K., [171], 377
[Salmon, E. S.], 561
Saloheimo, L., 206
Salord, J., 80
Sánchez-Monge, E., 10
[Sanders, F. K.], p. 158
Sankewitsch, E., 551
Sarachek, A., 151
Sato, K., 368
Sato, T., 241
Sax, K., 78
Scaletti, J. V., 116
Scaramuzzi, F., 725
Scarascia, G.-T., 548
Ščerbakova, S. S., 401
Schaaffhausen, R. v., 382
Schad, C., 636–7
Schaepman, H., 384
Schaller, C. W., 339
Schantz-Hansen, T., 699
Schlehuber, A. M., 215
Schertiger, A. M., 763
Schlösser, L. A., 532
[Schneider, L. K.], 5
Schneiderman, H. A., 78
Schreiner, E. J., 676
Schultz, E. S., 456
[Schultz, J.], 5
Schultz, J. H., 475, 714, 748
Schwanitz, F., 83, 188
Schwartz, D., 302
Scott, D. H., 653
Sen, N. K., 747
Sengbusch, R. v., 499
Senjuškin, A. E., 567
Sergeeva, K. D., 651–2
Serra, J. A., [6], 51
Shah, G. L., 799
Shakudo, K., 333
Shands, H. L., 275, 338
Sharma, A. K., 53
Sharma, C., 662
Sheffner, A. L., 152
Shelor, E., 796
Sheng, G., 131
Sheng, T. C., 131
Shida, S., 360
Shimazaki, Y., 377
Sieglinger, J. B., 348
Sill, W. H. (Jun.), 740, 770
Silva, V. B., 305
Silva, M. Vianna e, 353
Simmonds, N. W., 663
Simon-Reuss, I., 59
Singh, H. B., 194, 761
Singleton, V. L., 408
[Simpson, K.], 4
[Simpson, D. M.], 485
Simpson, G. W., 474
Siregar, H., 366, 370
Sisler, W. W., 341
Skau, D. B., 580
Skvirskaja, S. B., 448
Slate, G. L., 649
[Smith, A. M.], 4
Smith, H. H., 550
Smith, J. B., 352
Smith, L., 209
Smith, N. McD., 522, 524
Smith, O., 455
Smith, P. G., 477
Sneep, J., [598], 708
Snegirev, D. P., 563
Sokolov, G. A., 344
Solignat, G., 636–7
Solovjev, G. M., 259
[Sonneborn, T. M.], 5
Sosa-Bourdouil, C., 48
Soubiès, L., 310
Sparrow, A. H., 66
Spiegelman, S., [5], 155
Spina, P., 644
Sprague, G. F., 311
Sprague, M. A., 423
Sprague, V. G., 389
[Stadler, L. J.], 5–6
Stapleton, G. E., 105, 107
Starr, G. H., 766
Stebbins, G. L. (Jun.), [6], 400
Steindl, D. R. L., 524
Stephens, J. C., 350
[Stephens, S. G.], 5
Stern, K., 693
[Stevenson, F. J.], 175
Stewart, C. W., 517
Stewart, D., 541
Stewart, W. N., 763
Steyaert, R. L., 631
Stoa, T. E., 341
Storey, W. B., 641
Stubbe, H., p. 156
Subramaniam, M. K., 147
Suetsugu, I., 228
Sugawara, T., 478
Šuljga, P. M., 784
Šulyndin, A. F., 346, 425
[Swann, M. M.], p. 157
Swenson, S. P., 788
[Szilard, L.], 5
Szybalski, W., 121

Taggart, W. G., 525
Tai, S. E., 439
Takahashi, M., 358, 369, 372
[Takenaka, Y.], 171
Tandler, C. J., 50
Tandon, S. L., 568
Tate, S., 369
Tavernier, J., 617
Taylor, H. E., 114
Taylor, J. C., 734
Teas, H. J., 309
Tedin, O., 204, 279, 476
Téllez Molina, R., 210
Tesar, M. B., 402
Thijn, G. A., 460
Thomas, I., 247
Thomas, M., p. 164
Thommen, E., p. 161
Thompson, E. G., 543
Thompson, H. C., 455
Thompson, R. C., 731
Tihonov, M., 411
Toole, E. R., 127
[Torpe, N. V.], 251
Toxopeus, H. J., 433, 444, 467–8
Trail, G., 665
Troll, H.-J., 432
Trullinger, R. W., 176
Tsvetoukhine, V., 261
Tucker, J. M., 682
[Tydeman, H. M.], 594

Ullman, H., 719
Ullstrup, A. J., 320
Ulrich, A., 534
Unrau, J., 225

van Campo-Duplan, M., 695
van Dillewijn, C., p. 166
van Schouwenburg, J. Ch., 370
van Winkle, Q., 54
Varenica, E. T., 345
Vazart, J., 64, 565
Veenstra, G., 170
Vega, J., 674
Veksler, A. I., 597
Vendrely, C., 43–4
Vendrely, R., 43–4
Venot, P., 636
Verkerk, K., 100
Vestergaard, E., 208
Vetušnjak, L. F., 738
Vinnik, A. G., 738
Vishnu Swarup, 761
Vishveshwaraiah, S., 736
Visser, R. H., 529
[Visser, T.], 598
[Viveiros, A.], 6
Vladimirov, I. F., 406
Voisenat, P., 410
Vollema, J. S., 592
von Brandt, H., 26
Voureka, A., 120

Wada, B., 57
Wadleigh, C. H., 239, 525
Wagenaar, G. A. W., 370
Wagner, R. P., 140
Walker, J. C., 740, 770, p. 163
[Walker, P. M. B.], p. 158
Wallace, G. B., 664
[Waller, E.], 251
[Wålstedt, I.], 251
[Walter, T. E.], 557
Walters, H. J., 766
[Walters, M. S.], 6
Wang, C. S., 519
Ward, G. C., 2
Warid, W. A., 718
Wark, D. C., 473
Warmbrunn, K., 245
Warner, J. N., 283
Waterhouse, W. L., 270
Waterschoot, H. F., 100
Webb, R. E., 734
Weber, C. R., 777
Webster, O. J., 242
Weiss, J., 47
Weiss, M. G., 777
Wellensiek, S. J., 100
Wernham, C. C., 318
[Westergaard, M.], 5
Wickizer, V. D., p. 166
Wiebe, G. A., 339
Wiidakas, W., 289
Wilczynski, J., 9
Williams, L. F., 777
Wilsie, C. P., 413
Wilson, R. A., 618

Winge, Ö., 153
Wintrebert, P., 23–5
Wit, F., 394
[Witkin, E. M.], 5
Witkus, E. R., 55
[Wood, C. A.], 594
Wood, G. M., 423
Woodroof, J. G., 796
Woodrow, A. W., 418
Worthington, J. T., 756
Wright, G. M., 234
Wright, S., 21
Yadava, R. S., 793
Yamamoto, K., 330
Yamamoto, T., 335
Yamasaki, M., 726
Yanofsky, C., 136, 138
Yarimizu, H., 775
Yarnell, S. H., 797
[Yates, H. B.], p. 158
Yates, J. J., 424
Young, H. E., [588], 591
Younger, C. J., 782
Yusuf, N. D., 515
Zaĭceva, A. A., 785
Zaĭkovskaja, N. Ė., 533
Zakopal, J., 459
Zamkovoĭ, G. T., 254
Zdruĭkovskaja, A. I., 628
Zelenskiĭ, M. A., 233
[Zinder, N. D.], 5
Zohary, M., 642
Zucchini, M., 498
Zwaan, A. R., 16

THE COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS,

School of Agriculture, Cambridge, England.

Consultant Director:
PROF. SIR FRANK L. ENGLEDOW, C.M.G., M.A., F.R.S., Drapers' Professor of Agriculture.

Director: P. S. HUDSON, Ph.D.

Assistant Director: R. H. RICHENS, M.A.

Assistants: MISS T. ASHTON, M.A.
MISS P. M. C. GREEN, B.A.
B. E. HEISELER.
MISS M. L. C. WILSON, B.A.

Publications:

PLANT BREEDING ABSTRACTS.

Issued quarterly. Subscription 60/-, with Subject Index. (Subscriptions sent direct from within the British Commonwealth of Nations are subject to a reduction of 20%.) Single copies 18/- each. Drafts should be made out in sterling currency.

Copies of "Plant Breeding Abstracts" printed on one side of the paper can be supplied, for the convenience of readers wishing to cut up and file the references, at an additional cost of 12/- per volume.

Important Note.—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Director copies of their papers immediately on publication.

Other Publications:

TECHNICAL COMMUNICATIONS	*s.*	*d.*
Joint Publication No. 1. Vernalization and Phasic Development of Plants ..	10	0
An Outline of Cytological Technique for Plant Breeders	1	6
The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe	1	0
Field Trials: their Lay-out and Statistical Analysis, by John Wishart	2	6
Joint Publication No. 3. The Breeding of Herbage Plants in Scandinavia and Finland	4	0
New and Promising Varieties recently described in the Literature (Issues 3, 4 and 6) .. .. each	1	0
Issue No. 7	2	6
Joint Publication No. 5. The Production of Seed of Root Crops and Vegetables ..	3	0
Photoperiodism in the Potato, by C. M. Driver and J. G. Hawkes	2	6
Potato Collecting Expeditions in Mexico and South America. II. Systematic Classification of the Collections, by J. G. Hawkes	7	6
Cultivation and Breeding of Russian Rubber-bearing Plants	2	6
Joint Publication No. 8. Forest Tree Breeding and Genetics, by R. H. Richens	5	0

TECHNICAL COMMUNICATIONS—*continued.*	*s.*	*d.*
The New Genetics in the Soviet Union, by P. S. Hudson and R. H. Richens ..	6	0
The Use of Heterosis in the Production of Agricultural and Horticultural Crops, by Miss T. Ashton	3	0
Technique of Breeding for Drought Resistance in Crops, by Miss T. Ashton ..	2	6
Field Trials II: The Analysis of Covariance, by J. Wishart	3	6
The Theory and Practice of the Backcross Method in the breeding of Non-cereal Crops, by Mrs. M. Thomas	15	0
INDEXES		
Subject Index to Vols I to V of Plant Breeding Abstracts	2	6
Subject Index to Vols VI to VIII of Plant Breeding Abstracts	2	6
Subject Indexes to Vols IX-XX of Plant Breeding Abstracts .. .. each	2	6
BIBLIOGRAPHICAL MONOGRAPHS		
Breeding varieties resistant to disease. (1930)	2	0
Bibliography on insect pest resistance in plants. (1944)	1	6
Bibliography of Baking Quality Tests. Supplement	1	6

Subscriptions to any of the above Publications should be sent to Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham House, Farnham Royal, Nr. Slough, Bucks, England.

Loss in Transit.—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

COMMONWEALTH AGRICULTURAL BUREAUX

JOURNALS PUBLISHED BY BUREAUX ON RELATED SUBJECTS

	Published by the
Herbage Abstracts (45/-)	Commonwealth Bureau of Pastures and Field Crops, Aberystwyth.
Field Crop Abstracts (45/-)	Commonwealth Bureau of Pastures and Field Crops, Aberystwyth.
Horticultural Abstracts (50/-)	Commonwealth Bureau of Horticulture and Plantation Crops, East Malling.
Soils and Fertilizers (50/-)	Commonwealth Bureau of Soil Science, Harpenden.
Forestry Abstracts (60/-)	Commonwealth Forestry Bureau, Oxford.

The annual subscription to the above journals is indicated in brackets; a special reduction of 20 per cent is given for orders received direct from subscribers in Great Britain, the Dominions and Colonies.

RECENT AND FORTHCOMING OCCASIONAL PUBLICATIONS ON AGRICULTURE AND FORESTRY

C.A.B. REPORTS AND DIRECTORIES

Gazetteer of Agricultural and Forestry Research Stations in the British Commonwealth. (1952)	30s. 0d.

C.A.B. JOINT PUBLICATIONS

No.		
10.	The Use and Misuse of Shrubs and Trees as Fodder. Commonwealth Bureaux of Pastures and Field Crops and Animal Nutrition and Commonwealth Forestry Bureau. 1947	9s. 0d.
12.	Phenothiazine 1942-46: A review and bibliography. 1948	4s. 0d.
13.	Pregnancy diagnosis tests: A review. A. T. Cowie. 1948	15s. 0d.
14.	The establishment of vegetation on industrial waste land. By R. O. Whyte and J. W. B. Sisam	10s. 0d.

TECHNICAL COMMUNICATIONS, ETC.

Commonwealth Bureau of Pastures and Field Crops, Aberystwyth.

39.	Five hundred varieties of herbage and fodder crops. (A list of varietal names, including information supplied by specialists on the characteristics and use of the crops.) 1948	15s. 0d.
40.	The production and utilization of Silage. A survey of world Literature in Abstracts	10s. 0d.
41.	Management and Conservation of Vegetation in Africa. 1951	10s. 6d.

Commonwealth Bureau of Horticulture and Plantation Crops, East Malling.

20.	Growth substances and their practical importance in horticulture. By H. L. Pearse. 1948	12s. 6d.
21.	Recent Advances in Fruit Juice Production. By V. L. S. Charley and others	15s. 0d.

Commonwealth Bureau of Soil Science, Harpenden.

45.	Bibliography of Soil Science, Fertilizers and General Agronomy, 1947-50. 1951	35s. 0d.
46.	Proceedings of the First Commonwealth Conference on Tropical and Sub-Tropical Soils	25s. 0d.

Commonwealth Mycological Institute, Kew.

24.	The plant diseases and fungi recorded from Mauritius. By P. O. Wiehe. 1948	5s. 0d.
25.	Fungi of Barbados and the Windward Islands. By R. E. D. Baker and W. T. Dale. 1948	3s. 9d.

All correspondence regarding subscriptions to current and back volumes of abstracting journals and the purchase of Occasional Publications, Technical Communications, Bulletins, Bibliographies, etc., to be sent to—Commonwealth Agricultural Bureaux, Central Sales Branch, Farnham House, Farnham Royal, Nr. Slough, Bucks, England.

PRINTED BY W. HEFFER & SONS LTD., CAMBRIDGE, ENGLAND